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THE PAN-PACIFIC ENTOMOLOGIST

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SWARMING OF ANTS ON WESTERN UNITED STATES MOUNTAIN SUMMITS

JOHN A. CHAPMAN

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In July, 1951, surprising numbers of insects were noted at the top of an 8,000 foot mountain near Missoula, Montana. During the following year, many personal conversations about summit insects were held with men who had manned U. S. Forest Service fire lookout stations at various times in the past. These conversations revealed that gatherings of large numbers of winged ants on mountain and ridge tops were of fairly common occurrence in western Montana and northern Idaho and actually constituted a regular and considerable nuisance at some lookout points.

A search through the literature on ants for information on mountain top swarming yielded only a few observations from North America, of unusually high altitude distribution of winged individuals belonging to certain species, although some European records of ant swarming and mating activity on hill and mountain tops were found. It was felt that such an apparently widespread phenomenon should be further investigated. A program was initiated to try and secure additional information and observations on summit swarming of flying ants from Forest Service personnel located on the network of mountain top lookout stations throughout the western United States, and also to study the phenomenon locally, in conjunction with a general investigation of insect activity on one nearby mountain summit.

A single data sheet which could be readily filled out was prepared and the request made, through Forest Supervisors of the various National Forests in the western United States, that copies be placed with as many fire lookout observers as possible. This form was accompanied by an explanatory note describing some aspects of swarming behavior in ants and explaining the study program. The information supplied through these forms for the summer of 1952 as well as some data from previous years, based upon the memory or records of various individuals, was sum-

* This study was accomplished while the writer was on the staff of Montana State University.

marized and analyzed. About 30 persons who had observed summit ant swarms themselves were personally interviewed.

Summit swarming of ants was studied locally on Squaw Peak, altitude 7,996 feet, about 25 miles northwest of Missoula, Montana. This peak is rather isolated and has a fairly well defined summit below which there are extensive slide rock areas with patches of soil here and there supporting trees and alpine vegetation characteristic of the region. Nine visits were made to this peak during the period from late June to early September, 1952. Winged ants were directly taken and observed on July 28, 29, August 3, 8, 9 and September 2 and were collected at various times from pans of oil-covered water which were set out on and near the summit on June 28 and left until August 26 or September 2. These pans were of two sizes, 12x19x2 inches and 16x25x3½ inches and one of each size was placed at each of three stations whose relationship to each other is as follows: station A, summit, altitude 7,996 feet; station B, 163 feet from A, altitude 7,972 feet; station C, 173 feet from B, altitude 7,921 feet. The two lower stations were located at 290° with respect to the highest station. Small patches of soil and vegetation occurred at station A, but substrate at stations B and C consisted entirely of large lichen-covered rocks. Insects from the two pans at station C were kept together as were those from station B pans. The small pan (station A_1) at the summit was located on a four and one half foot cairn while the large pan (station A_2) rested on the adjacent summit surface. After these two pans were found to differ greatly in the number of ants trapped all insects from them were kept separately. On days when direct observations were made the estimated abundance, distribution on and around the summit, mating activity, and general behavior of winged ants were frequently noted. Altogether about 39 hours were spent in actual study and observation of general insect activity on and near the summit at times when winged ants were present.

Condensed and sumarized data from summit lookout stations are presented in Figure 1[1] and in Table 1[2].

It should be recorded that many of the lookout station observers supplemented the information on their data sheets with more or

[1] Base map supplied through courtesy of McKnight and McKnight Publishing Co., Bloomington, Illinois.

[2] It is regretted that the help of the large number of fire lookout observers and District Rangers of the U. S. Forest Service who supplied information used in this study cannot be individually acknowledged here.

less detailed accounts of the ant swarming seen. These accounts agree with the descriptions of most persons who were personally interviewed and with the observations of the writer on Squaw Peak in consistently indicating 1) the location of swarms to be tops of mountains or ridges and 2) a definite restriction of the swarms to a rather small area at the actual summits, usually the highest object or objects there such as roof, windows and external stove pipe of the cabin, and in a few cases the tops of trees immediately

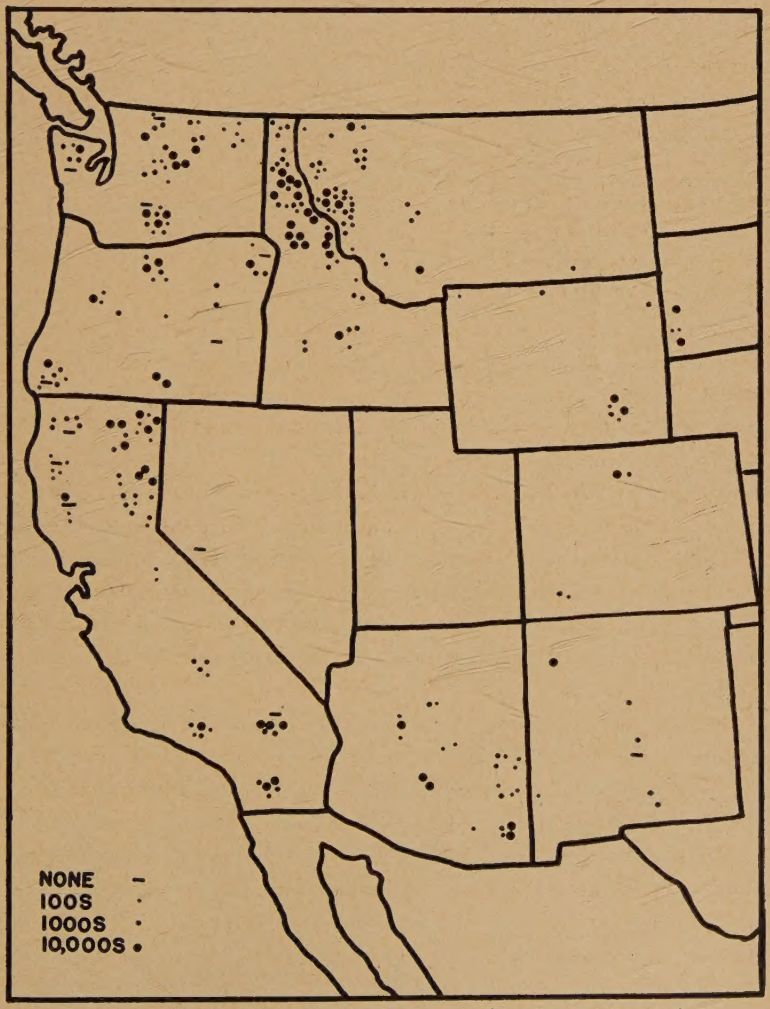

Fig. 1 Map showing distribution of reports of summit ant swarming.

adjacent to the summit as well. Frequently, when cabins were elevated on towers (which ranged up to 90 feet in height) swarms would be present by or on the cabins but not on the surface of the ground below.

TABLE I. CONDENSED AND SUMMARIZED INFORMATION FROM LOOKOUT STATION OBSERVERS

	Number of Reports		*Number of Reports*
Total	256	Altitude—all swarms of ants	
Size swarms (maximum numbers reported from any area)		0 - 2,000 ft.	0
100s	69	2,000 - 4,000 ft.	21
1000s	111	4,000 - 6,000 ft.	73
10,000s	65	6,000 - 8,000 ft.	89
Mating of ants observed	163	8,000 - 10,000 ft.	43
Shedding of wings observed	36	over 10,000 ft.	5
Maximum numbers ants on relatively warm calm days (wind less than 3 m.p.h.)	118	Altitude—swarms of tens of thousands of ants	
		2,000 - 4,000 ft.	6
		4,000 - 6,000 ft.	23
		6,000 - 8,000 ft.	18
		8,000 - 10,000 ft.	8
		over 10,000 ft.	2
Location of swarms at actual summit or top of ridges and mountains	240	Time of year at which swarming was noted	
Time of day at which swarms were reported to occur		May	2
7 - 10 A.M.	132	June	30
10 - 12 A.M.	164	July	198
12 - 2 P.M.	102	August	143
2 - 4 P.M.	72	September	40
4 - 6 P.M.	41		

Some degree of close observation is necessary in order to observe mating activity in swarms, and it was consistently noted on Squaw Peak at times of even light swarming. It is therefore felt that this activity is probably quite a consistent feature of summit swarming.

Shedding of wings was reported relatively few times. This might be due to the inconspicuous nature of the process or to the tendency of dealate females to seek shelter and thus be overlooked. However, no wing shedding was noted on Squaw Peak. Also, many observers described such large invasions of lookout cabins by the winged ants that they died in great numbers there, while at the same time stating that no shedding of wings was seen. Seevral persons interviewed stated that they had not noticed loss of wings and felt fairly certain that, because of the large numbers of winged ants present, they would have observed this had it been widespread.

Several collections of winged ants which occurred in summit swarms were sent in with the data forms. The ants represented and the number of samples in which each was found are as follows:[3]

Formica sanguinea subnuda Em.	24
Formica sp. *(microgyna* group)	1
Formica sp.*(fusca* group)	1
Formica sp. *(sanguinea* group)	1
Formica sp.	9
Leptothorax canadensis Prov.	9
Leptothorax sp.	2
Myrmica aldrichi (Whlr.)	2
Myrmica lobicornis fracticornis Em.	1
Myrmica (Myrmica) sp.	10

On the days when the writer observed the flying ant activity on Squaw Peak there was no doubt about the preference of the ants for the actual summit and, in the case of *Formica sanguinea subnuda*, for the two cairns on the summit (one eight feet and the other four and a half feet high). These ants were observed on July 29, August 3 and 9 to congregate in numbers (up to several hundred) on the upper rocks of the cairns, where they would crawl about actively and where mating took place. There always appeared to be many more males than females, a difference which showed up in most samples of this species which were set in by lookout observers. Counts made of samples of pan collected specimens gave the following ratios of males to females: 377 to 33, August 3; 377 to 16, August 9; 377 to 15, August 26.

Leptothorax canadensis, noted in hundreds on July 29, appeared to form loose flying groups to the leeward of the smaller cairn and only scattered individuals were seen elsewhere at that time. Data from the oil-water pans, given in Table II, show clearly that for both of these ants preference for the summit itself, and in the case of *F. sanguinea subnuba* the cairns specifically, exists. Differences in relative numbers of *L. canadensis* taken by large and small summit pans suggest some shifting of specific swarming site of this species about the summit. No aggregations of either species were seen away from the actual top of the peak although surrounding lower areas were frequently visited in order to determine swarm distribution.

Maximum numbers of ants were noted on relatively warm calm days. At these times the ants could be seen flying about at

[3] All specimens were identified by M. R. Smith, U S National Museum.

the summit without being apparently influenced by air currents. At other times the ants seemed to have difficulty reaching and maintaining themselves on the cairns against the force of the wind. There is no doubt about the presence of eddies of air currents around the summit. At times, for example, southwesterly winds of eight to eleven miles per hour were measured there, while 20 to 50 feet down on the east side (10 to 50 feet in vertical elevation) velocities were close to zero. However, ants were never seen to swarm at such points.

TABLE II. ANTS COLLECTED BY OIL-WATER PANS ON AND NEAR SUMMIT SQUAW PEAK

Date of Collection[4]		*Station A_1 Cairn*	*Station A_2 Summit Surface*	*Station B*	*Station C*
July 3	large[5]	109	(ants from	0	0
	small[6]	5	Station A_1 and A_2 combined)	0	0
July 15[7]	large	522	not noted	0[8]	0[8]
	small	not noted	not noted	not noted	not noted
July 29	large	1418	400	5	5
	small	2285	3477	34	3
August 3	large	7922	265	26	8
	small	10244	3468	963	211
August 9	large	2701	238	9	6
	small	2511	3340	342	125
August 26[7]	large	2090	268	14	4
	small	695	5310	552	187
September 2	large	8	not used	not used	not used
	small	13			

There are limitations to the use and intepretation of the information secured from fire lookout observers. Much of it was furnished by persons lacking technical training in biology and may be incomplete and even incorrect. Frequently only part of the information requested was given. Many of the lookout stations from which reports were received were manned only during certain periods of the summer, depending on area fire danger ratings, and

[4] Pans set out June 28.

[5] Mostly **Formica sanguinea subnuda** Em.

[6] Mostly **Leptothorax canadensis** Prov.

[7] Pans all dry on these dates.

[8] Small pans only were checked.

thus do not include all instances of swarming which might have occurred. However, many observations had undoubtedly been carefully made and the data as a whole probably provide a reasonably good picture of many aspects of mountain summit ant swarming in the areas represented.

In trying to determine the causes of summit abundance of winged ants it is necessary to carefully consider the possible effects of wind on these ants. Complex air currents are a characteristic feature of mountainous regions. The topography influences and modifies large air mass movements in one direction and heating and cooling of the varied land surfaces, due to gain and loss by radiation during the day and night, respectively, produce varied local air movements. Fire control studies in the northern Rocky Mountain region by the U. S. Forest Service (Barrows, 1951) have shown that, as a general rule, upslope winds commence around 9:00 A.M. and continue until late afternoon when, after a short transition period, downslope winds occur. It is logical to assume that updraft air currents play a role in mountain top ant swarming. It is known that air currents can transport ants as well as other insects to considerable distances above the surface of the earth even under relatively mild weather conditions (Glick, 1939). In many ant species the reproductive forms leave different nests within an area at much the same time so that some temporary abundance of winged ants may be noted in almost any locality. (Forel, 1875, 1930; Emery, 1891; Wheeler, 1910). If ants emerge at lower elevations during the day any updraft currents would tend to carry them upwards. Winged ants are not considered to be strong fliers and almost any air movement in a particular direction might be expected to affect their distribution. Once ant reproductives were present in numbers on a summit, one would expect their mating activity to proceed as it would below.

It is interesting to note that in 118 of the reports from lookout stations and also at Squaw Peak, maximum numbers of ants were observed on warm calm days, if winds of three miles per hour and less are included in the calm category. Many ant species tend to swarm on such days at lower elevations. It is recognized that thermal updrafts are probably more clearly defined and therefore relatively more important as transporting agents on these warm calm days than at other times where more general air movements may play the dominant role.

Continuous measurements of air currents around a peak coincident with summit abundance of winged ants have not been made. The actual extent to which updrafts of various velocities might tend to carry ants of different sizes and flight powers likewise is not known although there is evidence, in abnormally high distibution of scattered ant reproductives, that air currents can transport ants upwards for considerable distances. Wheeler (1917a, 1917b) suggested that in mountainous regions winged ants were frequently carried above the normal species range by air currents and that annual loss of such individuals in terms of potential colony establishment might cause a considerable drain on certain species.

It is not yet possible to completely evaluate the role of updraft air currents as they may relate to summit ant swarming. However, there are several indications, based both on the writer's study on Squaw Peak, and on the data secured by others, that the ant swarms observed cannot be accounted for by air currents alone.

Probably the main difficulty in explaining summit swarming entirely on the basis of air currents is the apparent localization of ant swarms, of all sizes, at the actual tops of mountains and ridges and frequently within small areas on the summits. The Squaw Peak pan collection data show a very clear preference for the actual summit. Moreover, concentrations within a small area were repeatedly described by the lookout observers. There were far more opportunities for these observers to notice the ant swarms at summits that at lower elevations due to the fact that almost all lookout stations are located on the highest points of mountains or ridges. However, it was specifically reported by several persons that areas below the summits were visited during periods of swarming, and it can be assumed that there were many more observations made away from the highest points during such times in view of the following points: 1) swarming was frequently reported to be of several days duration, 2) leave and activities such as trail maintenance and transportation of water, for example, require that observers be away from the summit at times. Actually not a single person reported simultaneous swarming of ants at lower elevations and at summits.

Lookout stations from which "tens of thousands" of ants were reported ranged from 2,600 feet to 11,030 feet in altitude and included bare rocky peaks, where thermal air currents might be expected to be fairly strong, and grassy or brush and forest covered

ridges and hills, where thermals are certainly not as well developed. It might be noted that in all but a few cases reported by fire lookout observers only one or two kinds of ants were seen to swarm at any one summit.

Forel (1875, 1930) reported that swarms of *Myrmica rubra*, and of other species presumably, at times would form over standing men, roofs of houses, tall trees, church steeples, hill summits and even mountain tops and he recorded some summit mating activity for several species of ants.

It is hard to believe that air currents alone would produce such large localized concentrations of ants and at sites such as some of the points mentioned by Forel, or reported by lookout observers, or the cairns on Squaw Peak. One would expect wind or updraft carried insects to be scattered along the approaches to distinct peaks and throughout the length of ridges, since there is certainly some eddying of air currents below or near the highest point in either case. As a matter of fact one could also expect that updraft currents strong enough to be a major factor in carrying insects would tend to transport them on up above and away from the ridgetops or peaks. It is interesting to note in this respect that several other types of insects tend to be more abundant on mountain peaks and summits than below such areas (Chapman, 1954).

In summing up the consideration of air currents as the cause of summit abundance of winged ants it would seem that although such currents may play a role, a definite preference for the summits of ridges and mountains as swarming sites is shown by some ant species.

It is hoped that future work may provide more specific information on distribution of various summit swarming species, on the fate of winged ants after swarming, including the extent of wing shedding by females, on the duration of swarming for various species, distances through which summit ants may travel and on a number of other phases of this phenomenon which are not well known at present.

SUMMARY

Information and observations on the swarming of winged ants on mountain summits were secured from persons stationed at summit fire lookout stations throughout mountainous regions of the western United States during the 1952 summer season. Some records from years prior to 1952 were also obtained. This data was

recorded for the most part on a form which proided for systematic recording of desired information, and is summarized, analyzed and discussed in this report. Studies of mountain top ant swarming were also made by the writer on an 8,000 foot mountain near Missoula, Montana. Insects were collected and observations made at intervals during the summer of 1952 and the resulting data presented and discussed. It is felt that the following conclusions are justified:

1. Swarming of winged ants of certain species at the very summits of peaks and ridges is a definite and fairly widespread phonomenon in many of the mountainous regions of the western United States.

2. Although it is not possible at present to accurately determine the role of updraft air currents in producing such swarms it is unlikely that updrafts are the only casual factor.

3. An instinctive tendency to seek such points as swarming sites is probably present in some ant species.

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THE MALE OF TASTIOTENIA FESTIVA

(Hymenoptera, Pompilidae)

Howard E. Evans

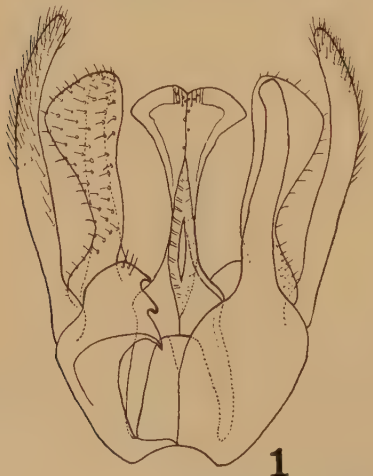
Cornell University, Ithaca, N.Y.

A few years ago I described an unusual new genus of pompilid wasps, *Tastiotenia*, based on two females, one from Needles, California, and one from Guaymas, Sonora, Mexico (1950, Trans. Amer. Ent. Soc., 75:150). In the description a number of curious morphological features were pointed out, and the unique wing venation was described and figured. It was concluded that the genus apparently belonged to the tribe Pompilini, but that it must represent a relict of a very early type. I have awaited the discovery of the male of this genus with considerable anticipation. Fortunately I have not had to wait long, for an intrepid wasp-hunter, Dr. Paul D. Hurd, Jr., has recently collected a male *Tastiotenia* at Borego, San Diego County, Calif., May 2, 1952. Although differing in color from the female *T. festiva*, the difference is no greater than often occurs between the sexes in Pompilidae, and I feel certain that it represents the male of this species. The male keys readily to *Tastiotenia* in my key to the Nearctic genera of Pompilini, and the wings are virtually identical with those figured.

The male possesses all the unusual features of the female plus a few of its own, notably the flattened and somewhat expanded hind basitarsus and tibial spurs, and the oddly shaped last antennal segment. The terminalia, however, are remarkably conventional, and on the basis of these alone one might easily place *festiva* in the genus *Pompilus*, in fact close to *phoenix*. It is difficult to believe that these resemblances are more than coincidental. However, the placing of *Tastiotenia* in the Pompilini seems thoroughly justified on the basis of the genitalic structures.

Description of male.—Length 4.5 mm.; fore wing 3.8 mm. Posterior margin of pronotum with a prominent ivory-white stripe, including the posterior lobes, and the apical abdominal tergite with a large white spot; posterior femora bright rufo-ferruginous, dusky at base and apex; apical half of mandibles rufous; color otherwise black. Wings hyaline, the apical fourth of the fore wings lightly banded with brownish. Body clothed with a somewhat coarse silvery pubescence, more dense and suberect on the propodeum; pubescence grading into brownish on the extremities of the legs. *Mandibles* with a single strong tooth on the inner margin. Clypeus 3.5 times as broad as high, the apical margin broadly, weakly concave. Malar space extremely short. Front very broad, the middle interocular distance .66 times the transfacial distance; inner orbits approximately parallel, the upper and lower

interocular distances about equal. Ocelli rather widely separated on the broad vertex, forming a right angle in front; postocellar and ocello-ocular distances about equal. Vertex elevated in a low, even arc above the eye-tops. Antennae short; first four segments in a ratio of about 17:9:8:10, the third segment thus actually shorter than the pedicel, and only very slightly longer than thick; outer flagellar segments (7-12) approximately as long as their greatest thickness; apical segment about 1.5 times as long as thick, its apex abruptly, obliquely flattened. *Pronotum* short, its posterior margin feebly angulate. Scutellum very prominent; postnotum approximately as wide as the metanotum, distinctly impressed medially. Propodeum without a well-defined posterior rim. Legs feebly spinose; femora with one or two minute spines near the apex; middle and hind tibiae and tarsi with scattered very small spines. Hind coxae large, about 1.5 times as long as the middle coxae. Hind tarsus compressed, the basal segments somewhat expanded: basitarsus considerably broader than the tibia at its base; longer spur of hind tibia broadened and flattened, narrowly fusiform (shorter spur of hind tibia wanting in this specimen). Tarsal claws feebly dentate. Wings as described and figured for the female in the original description. *Abdomen* short and relatively stout, the dorsum somewhat flattened, the sides rather flat and converging below, the abdomen in cross-section therefore somewhat trigonal. Sixth sternite deeply emarginate apically, without special modifications. Subgenital plate (fig. 2) with the median line roundly elevated, the apex narrowly rounded and the margin beset with stout spines, except the extreme apex with only weak setae. Genitalia (fig. 1) with the parameres very slender, clothed with short setae on the apical two-thirds; volsellae with the digiti broadly expanded apically and clothed with short setae; basal hooklets double; aedoeagus with a broad fan-shaped apical expansion.



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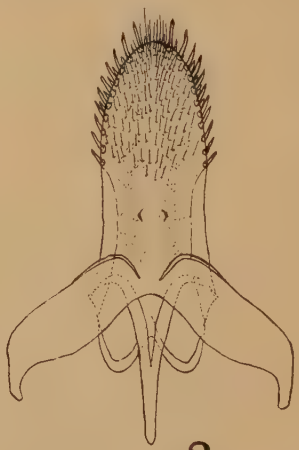

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EXPLANATION OF FIGURES

Figure 1—Male genitalia of *Tastiotenia festiva* Evans, ventral aspect on left side, dorsal on right. Figure 2—Subgenital plate, ventral aspect.

FOUR NEW SPECIES OF DOBSONFLIES FROM CALIFORNIA

(Megaloptera: Corydalidae)

Harry P. Chandler

California Department of Fish and Game, Red Bluff, California

Two of the species were suspected of being new when they were first collected in 1946 along with another new species which is being described elsewhere by a student who has worked out its life history. The other two species described here were discovered while working over the California Insect Survey and California Academy of Sciences collections during the preparation of the section on California Megaloptera for a book on the aquatic insects of California to be published by the University of California. There are still several undescribed species or subspecies in the west, but the author prefers not to describe them at this time because the picture of their speciation and distribution is not clear at present. Since the Nearctic species of this group were last keyed by Davis in 1903, the number of described species has doubled; and from the species included in *Chauliodes* have been separated four other genera. Van der Weele's world revision in 1910 threw considerable light on the generic picture but completely confused the species by placing in synonymy about half of the valid Nearctic species. In view of this, the author plans to revise the Nearctic Corydalidae in the near future.

Dysmicohermes ingens Chandler, new species

Holotype male: Alar expanse 122 mm.; body predominantly testaceous brown, sparsely covered with conspicuous long, silky hair. *Head* rufous, coarsely and closely punctate, except for smooth raised area on vertex; labrum transverse elyptical; clypeus smooth but otherwise poorly differentiated from front, apex straight, angled at sides and nearly straight to margin of eye. Antennae with 52 segments, filiform, relatively short, length about three times width of head, each segment a little longer than wide, covered with short microscopic pile, and sprinkled with short, depressed spines about ¼ as long as segment. Ocelli parallel with outer margin of antennae, middle ocellus less convex, 4/5 as wide as lateral ocelli, ocelli separated from antennae by about own width, middle ocellus separated from lateral ocelli by width of latter, lateral ocelli more widely separated from each other; cheeks of head parallel a little distance behind prominent eyes; mandibles mostly concealed when closed. *Pronotum* with sides nearly parallel, slightly convergent anteriorly, faintly alutaceous with fine punctures, covered with a short sparse pubescence. *Wings* (fig. 5), slightly translucent, stimga more so; veins brownish, not conspicuously variegated; fore wing with translucent brown spots, with slight tendency to be arranged along the veins, spots quite small except near the basal 1/5 and 2/5 of the wing where they form two

indistinct transverse bands. Hind wings more faintly spotted basally and posteriorly, none behind the cubitus. Radial sector with seven branches reaching margin, media two-branched in fore wing and four-branched in hind wing; cubitus three-branched. Fore wing with base of 1st anal conspicuously raised and covered by most pronounced black spot on wing; anterior branch of 2nd anal vein connected to the first anal by a cross vein which forms end of 1st anal cell, posterior branch of 2nd anal vein forming end of 2nd anal cell. *Genitalia* (figs. 3, 4), cerci with a deep cleft between the upper and lower lobes, reaching more than half way to base or nearly to convex pitted area on the lateral dorsal side near the base, anterior margin on ventral lateral side with deep emargination partially filled by base of an elongate osmeterium-like eversible membranous tube which may be withdrawn into the body, length of tube is about 2.5 times the width of the genital capsule, tube tapering to a point.

Allotype female: Alar expanse 160 mm.; very similar to male but larger. Genitalia; valves of ovipositor with convex pitted area near base, upper lobe short, lower lobe 2½ times as long, narrowed to middle.

Holotype, MIAMI RANGER STATION, MARIPOSA COUNTY, CALIFORNIA, 27 July 1946, elev. 5,000 feet (H. P. Chandler). *Allotype*, same data as holotype. Six *paratypes* are from the same locality and collected by H. P. Chandler in 1946 except as noted; ♂, 29 June, ♂, 6 July; 2♂♂, 21 July; ♂, 23 July; ♀, 29 July 1946 (T. O. Thatcher). One ♀ paratype from Sequoia Nat. Park, California and one ♀ from San Bernardino County, 1916, "Viggo Tarp." Holotype and allotype in the California Academy of Sciences collection. Paratypes in the California Insect Survey collection, Los Angeles County Museum, Museum of Comparative Zoology and the author's collection.

This species is closely related to *D. disjunctus* (Walker). The shape and venation of the wings are almost identical, but the coloration is different. In *D. disjunctus* the spots are larger, more intense and the membrane more hyaline, the head is less strongly punctured and more rugose, the ocelli a little smaller and the tranverse depression behind the eyes less pronounced, the four, medial, basal, raised areas on the vertex are separated by a medial and transverse groove of even width so as to form a nearly perfect cross. The genitalia as figured by Munroe (1953), while very similar in type is different in almost every detail.

With the possible exception of *Acanthacorydalis* which is found in the Orient, *D. ingens* has a larger wing spread than any other species in the order Megaloptera.

All except two specimens of *D. ingens* listed above were taken

in the summer of 1946 when the University of California entomology field class used the U. S. Forest Service insect laboratory at Miami Ranger Station just five miles south of Yosemite National Park. Most of the specimens were taken around a light trap that was operated part of the time. They were rarely taken in the trap or seen fluttering about it but were found at rest on some object near by. Apparently they came from a small stream that passed the camp on its way down the side of the canyon. Dr. Struble, one of the laboratory staff, on his way to work one morning, found a cast pupal skin about 20 feet from the stream. Knowing my interest in the adults, he located, about 6 inches away in the bank, the hole from which it had emerged. No larvae were ever taken.

Dysmicohermes crepusculus Chandler, new species

Holotype male; alar expanse 84 mm.; body color dark brown to pale, long hair very sparse and inconspicuous. *Head* dark brown to rufous with mouthparts and adjacent areas pale, except for black tip of mandibles; dorsal surface of head from clypeus to behind ocelli wrinkled and with microsculpture of short parallel ridges, from the eyes posteriorly microsculpture is more rugose with close set short, depressed hairs; smooth areas of vertex faintly alutaceous, scarsely raised or even slightly depressed. Labrum narrowly transverse, anterior margin straight with small emargination at middle, front marginated anteriorly with pale color, clypeus very narrow, depressed and smooth. Antennae about 3 times as long as width of head, fuscous brown, 35 segments, filiform tapering to end except basal segment which is nearly twice as wide as next few segments, segments about 3 times as long as wide, spinkled with short distally inclined spines 1/3 width of segment, micropile scarsely detectable on the basal segments. Outer margin of ocelli parallel with inner margin of antennae, ocelli separated from each other by width of lateral ocelli which are a little smaller, separated from antennae by 1.3 times width of median ocellus, diagonal ridge separating depressed area around ocelli from eyes. Mandibles mostly concealed when closed. *Pronotum* with sides slightly concave, a little wider anteriorly, color brown with anterior pale collar tapering to point at each side, microsculpture alutaceous, tending to short parallel ridges posteriorly and laterally; devoid of long pubescence, only a few short hairs near anterior and posterior margin. *Wings* (fig. 6), translucent; veins pale, not conspicuously variegated, both wings except anal area of hind wing spotted with moderate to small fuscous spots with slight tendency to form one or two transverse bands. Base of first anal of anterior wing moderately raised without entire raised area black. Costal area of fore wing widest at basal ¼ where it is wider than other cells of wing. Radial sector with seven branches reaching margin, R_3 forked beyond its middle; media two-branched in fore wing and three-branched in hind wing, cubitus with three branches reaching margin. Anterior branch of second anal vein connected to first anal vein by cross vein

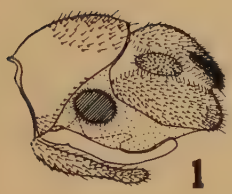
only, which forms end of first anal cell, posterior branch of second anal vein forming end of second anal cell. Genitalia (figs. 1, 2): cerci very short, upper and lower lobes represented by slight protuberances separated by a horizontal groove around end of cerci, ending near base of convex punctate area, eversible parallel-sided membranous tube three times as long as width of genital capsule, located on each side anterior to and below cerci.

Allotype female: alar expanse 106 mm.; generally similar to male except that sculpture and proportions of head are slightly different; white collar of pronotum less distinct; genital valves with upper and lower lobes barely projecting beyond convex pitted area which occupies most of side.

Holotype, Pyramid Ranger Station, Eldorado County, California, 20 Aug. 1952 (J. W. MacSwain); *allotype*, 2 mi. S.W. Miami Ranger Station (Girl Scout Camp, N. Fk. Fresno River), Mariposa County, California, 25 July 1946, elev. 5,000 feet (H. P. Chandler). Twenty-seven paratypes from California and one from Oregon as follows: *Mono Co.:* ♀, Convict Cr. Experimental Sta., 12 Aug. 1953, elev. 7,200 (I. La Rivers); *Mariposa Co.:* ♀, 2 mi. SW. Miami R. S., July 1946 ♂ & ♀, Girl Scout Camp, N. Fk. Fresno River, July 1953, elev. 5,000 (Girl Scouts); ♀, Nevada Falls, 29 July 1946, elev. 5,950 feet (H. P. Chandler); ♀, Yosemite, Aug. 1935 (E. S. Ross); *Nevada Co.:* ♂, Grass Valley, July 1942 (L. Bwd.); *Sierra Co.:* ♂, Goodyear Creek, 10 July 1921 (E. H. Nast); *Plumas Co.:* ♂, 4 mi. W. Quincy, 26 June 1949 (J. W. MacSwain); *Butte Co.:* ♂, Chico, 23 July 1951 (Berriman); *Shasta Co.:* ♂, Burney Creek Hatchery, 15 July 1947 (D. W. Adams); *Siskiyou Co.:* ♂, Dunsmuir, 30 June 1934 (G. H. & J. L. Sperry); 3 ♂♂ S. Fk. Sacramento River. 6 Aug. 1953 (H. P. Chandler); *Colusa Co.:* 11 ♂♂, 3 ♀♀, Paradise Creek, 23 July 1953, elev. 2,400 (H. P. Chandler); *Lake Co.:* ♂, Anderson Springs, 12 July 1953 (W. R. Bauer); and one ♂ collected by Behrens, who died in 1898, labeled "Francisco." Oregon, *Marion Co.:* ♂, Breitenbush Hot Springs, 5 July 1934, elev. 2,222 feet (H. A. Scullen). The holotype and allotype will be placed in the California Academy of Science collection; paratypes in the Cali-

EXPLANATION OF FIGURES

Fig. 1. *Dysmicohermes crepusculus*, lateral view of male genitalia. Fig. 2. Ventral view of the same. Fig. 3. *D. ingens*, lateral view of male genitalia. Fig. 4. Ventral view of the same. Fig. 5. Wings of *D. ingens*. Fig. 6. Wings of *D. crepusculus*. Fig. 7. *Protochauliodes simplus*, ventral view of tip of aedeagus. Fig. 8. *P. simplus*, lateral view of cerci. Fig. 9. *P. montivagus*, lateral view of cerci. Fig. 10. *P. montivagus*, ventral view of tip of aedeagus.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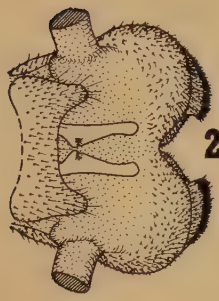
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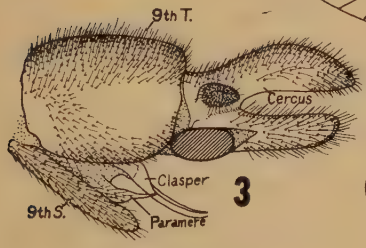
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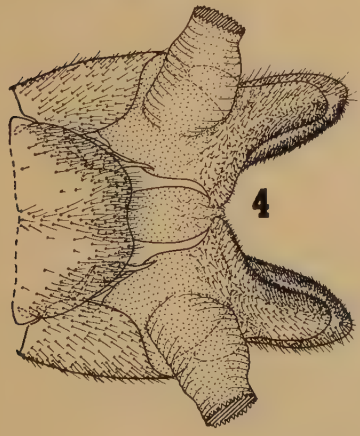
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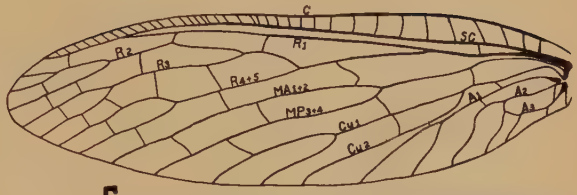
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fornia Insect Survey collection, Illinois Natural History Survey collection, Chico State Teachers College collection, Museum of Comparative Zoology and the author's collection.

This species is provisionally placed in *Dysmichohermes* but is not closely related to either *D. disjunctus* or *D. ingens*. From these two species it is most easily separated by its smaller size, the wide costal area of the fore wing, the hind wing with three branches of the media reaching the margin, and the genitalia. There is some variation in the specimens studied but it is difficult to describe. The number of segments in the antennae range from 35 to 47, seeming to be a little more numerous but shorter in the female. The antennae of the males were usually about 2.9 times as long as the width of the head, while those of the female were only about 2.2 times. The alar expanse in the males ranged from 67 mm. to 98 mm. while that of the females ranged from 100 to 108 mm. Other variations were noted, especially in the proportions and sculpturing of the head. The latter seemed a little more pronounced in the female.

Protochauliodes simplus Chandler, new species

Holotype male: Alar expanse 78 mm.; general body color fuscous with lighter markings, body with little hair except ventrally. *Head* fuscous brown, pale in front of antennae. Labrum with sides rounded, slightly emarginate medially. Antennae brown, 4½ times longer than width of basal segments. Ocelli large, median slightly smaller but as wide as front between antennae, only about 1/3 its width from antennae, lateral ocelli separated from eyes and median ocelli by own width, vertex behind ocelli not depressed but evenly rounded from side to side, smooth areas alutaceous, not conspicuously raised or darker, rest of vertex very finely rugose. *Wings* slightly translucent with many small, smoky spots with a tendency to be arranged along sides of veins and a few larger opaque spots along the anterior margin; fore wing with a larger spot covering the first medio cubital cross vein; hind wings with spots restricted to apical portion. R_{4+5} unbranched, R_2 and R_3 forked at apical third, R_2 without cross vein between its two branches; anterior branch of second anal vein stalking with first anal for a short distance, so that latter appears three branched. *Genitalia:* cerci (fig. 8), somewhat dorsoventrally flattened basally; aedeagus (fig. 7), nearly flat.

Holotype, Tanbark Flat, San Dimas Experimental Forest, Los Angeles County, California, 13 July 1950 (J. D. Paschke). Ten *paratypes*, all males, were collected from the same locality by A. T. MaClay (6), S. Miyagawa (2), E. G. Linsley (1) and D. E. Barcus (1) on July 7 (1), 12 (1), 17 (1), 18 (1), 22 (2), 23 (4), 1952. The holotypes will be placed in the California Academy

of Sciences collection with paratypes in the California Insect Survey collection, University of California collection at Davis, Los Angeles County Museum and the author's collection.

This species is related to *P. infuscatus* and *P. minimus*. The wing veination and body form of the species in this group are remarkably constant and sometimes the difference between species is less than individual variation within the species. Except that *infuscatus* is black and *minimus* is usually smaller, the only sure way of separating the species is by examining the genitalia.

Protochauliodes montivagus Chandler, new species

Holotype male: alar expanse 72 mm.; description similar to that of *P. simplus* except as noted. Lateral ocelli more than own width from eyes; smooth areas raised a little, rest of vertex with microsculpture of short parallel ridges. Wings with opaque spots more restricted, outer half of hind wing faintly potted. *Genitalia:* cerci (fig. 8), short and stubby, as wide at apex as at base as viewed from side; aedeagus (fig. 10), flat, only the tip chitinized ventrally.

Holotype from St. Charles Hill, Sierra County, California, 7 July 1921 (E. H. Nast collector). Three *paratypes*, all males, from Sierra City, Sierra Co., Calif., 25 July 1952 (Don Richtor); Quincy, 4 mi. W., Plumas Co., Calif., 2 July 1949 (R. L. Langston); and Lake Vernon, Yosemite, Calif., 25 July 1937 (E. Herald). The holotype will be placed in the California Academy of Sciences collection. Paratypes will be placed in the University of California collection at Davis, Los Angeles County Museum and the author's collection.

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MODIFIED FLAG FOR TICK COLLECTING

During two seasons of tick collecting the author noted three small cumulative disadvantages in the standard flagging method, when collecting ticks among low grasses and weeds, with few trees and bushes present. These were: (1) difficulty in obtaining maximum coverage of the flora because the flag was usually at an angle to the ground; (2) difficulty in prevention of flapping by moderate winds, and (3) inconvenience to the collector who was required to bend sharply in order to hold the flags close to the low vegetation.

To overcome these drawbacks, a flag was attached to a 3-ft. equilateral triangle with the 6-in. handle at the apex, and the muslin flag at the base. Each side was made of 3/16 in. steel wire, with half of a threaded bolt tip welded to each of the two ends which come together to form a handle attachment. To make the instrument more compact, the handle was made removable and the sides consequently folding, permitting one to wrap the handle and sides, together with the base, in the muslin.

In use, the flag can be (1) held in front, which permits tick collecting before the operator can jar or otherwise dislodge the arthropods, (2) pulled behind as a drag cloth, and (3) pulled beside the collector, on either side. Also, the flag is easily held parallel to the surface to be collected, assuring thorough coverage; because the instrument is easily controlled, slight movements by the collector can prevent undue flapping, even in moderately high winds, and there is a minimum of inconvenience to the collector. Though adapted for low vegetation, this instrument will work equally well on bushes and trees.—W. PETER HOREN, San Anselmo, California.

RANGE EXTENSION OF NOTONECTA SHOOTERI

(Hemiptera: Notonectidae)

I collected two specimens of *Notonecta shooteri* Uhler at Port Orford, Curry County, in a stream on July 7, 1951, and an additional three specimens three days later at Charleston, Coos County, in a pond. Both localities are located on Oregon coast. Marin County in California represented former northernmost records of this species. — BORYS MALKIN, University of Washington, Seattle.

NEW SPECIES OF NERTHRA FROM CALIFORNIA

(Hempitera: Gelastocoridae)

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During the course of a taxonomic revision of the family Gelastocoridae (Hemiptera), it was discovered that the genera *Nerthra* Say and *Mononyx* Laporte are congeneric. As *Nerthra* was described early in 1832 and *Mononyx* not until 1833[1], the former has priority and should be used as the generic name for those species formerly placed in the genus *Mononyx*.

For many years *Nerthra fuscipes* (Guérin-Méneville) has been reported from California, but these reports were misidentifications of a new species that occurs in the southern part of this state. A second new species has recently been collected in the vicinity of Parker Dam, San Bernardino County, California, by Doctor R. L. Usinger and Mr. Jack Lattin. The descriptions of these two species are presented at this time so that the names will be available for use in a faunal work.

Nerthra martini Todd, new species

Referring to this species:

1876. *Mononyx badius* Herrich-Schäffer; Uhler, Bull. U. S. Geol. Surv., pp. 336-337.

1894. *Mononyx stygicus* (Say); Uhler, Proc. California Acad. Sci., Ser. 2, Vol. IV, pp. 290-291.

1917. *Mononyx fuscipes* Guerin-Meneville; Van Duzee, Catalogue of Hemiptera, Univ. of California Publ., p. 474.

Size. Male: Length, 7.0 to 7.6 mm.; width of pronotum, 4.5 to 4.8 mm.; width of abdomen, 4.5 to 5.0 mm. Female: Length, 7.8 to 8.8 mm.; width of pronotum, 4.8 to 5.3 mm.; width of abdomen, 5.0 to 5.8 mm. *Color* varying from a yellowish-brown to black, generally a brown or reddish-brown. A whitish spot on each hemelytron mesad of the junction of the embolial and nodal sutures. In the black specimens the posterior third of the pronotum is generally spotted with pale yellow or white. Ventrally slightly lighter than dorsally; front femur uniform brown, intermediate legs light brown ringed with dark brown areas which may be faint in some specimens; last three abdominal segments lighter than rest of abdomen; connexivum with posterior third of each segment yellowish, anterior two-thirds dark. A few specimens examined were uniformly reddish-brown above and with a lighter marginal band ventrally which extended the entire length of the abdomen. *Structural Characteristics.* Apex of the head pointedly projecting with a pair of rather sharp-pointed tubercles at the tip, sometimes these tubercles

[1] Harris, H. M., Pan-Pacific Entomologist, Vol. 18, No. 1, pp. 161-162, 1942; shows that Laporte's paper did not appear in 1832 as s usually given.

are rather rudimentary; superapical tubercles present. Pronotum not very dilated laterally; lateral edge nearly straight, occasionally weakly sinuous at middle; lateral edge conspicuously converging anteriorly; posterior margin sinuated before scutellum. Pronotum at greatest width not as wide as abdomen in either sex. Scutellum broad, rather large, with slight tumescence on either side, mesad of which of are faint rounded depressions. Body sparsely covered with very small bristles, those on the scutellum being slightly clavate. Hemelytra well-developed extending beyond the apex of the abdomen. Lateral margin of the embolium nearly straight, not dilated. Connexivum barely visible from a dorsal view in the male, quite prominent in the female because the posterior abdominal segments are greatly dilated laterally. Last abdominal segment of the male rather large, over half as wide as the eighth abdominal segment, slightly longer than seventh or eighth abdominal segments, asymmetrical. Ventral abdominal segments of female asymmetrical; posterior margin of last abdominal segment more or less pointedly notched; a moderate tumescence on the left side, a faint tumescence on the right side of the last abdominal segment; a deep, elongate, transverse depression extending along the anterior margin of the last abdominal segment from the median line of the abdomen to the tumescence on the left side. Clasper of male (fig. 1) swollen apically; a weak process on the lateral surface and another on the dorsal surface; aedeagal furrow visible on the apical half of the ventral surface.

Holotype male, allotype female, 24 male and two female paratypes. Los Pensaguitos Creek, San Diego County, California, April 8, 1930, C. H. Martin, in the Francis Huntington Snow Entomological Collection at the University of Kansas. One male and one female paratypes, San Felipe Creek, California, April 14, 1935, C. E. Norland, (Usinger Collection). One male and one female paratypes, Los Angeles County, California, no date, Coquillett, (U. S. Nat. Museum). One male and one female paratypes, Riverside, California, March 2, 1927, T. Craig, (California Academy of Sciences).

In addition to the type series, the writer has seen specimens from the following localities:

California. Afton Canyon, San Bernardino County, July 17, 1931, R. E. Blackwelder, 1 male, (California Acad. Sci.); Ardeou, Dec. 25, 1915, J. C. Martin, 1 female, (California Acad. Sci.); Frenchman Flats, Tehachapi, April 8, 1951, R. L. Usinger, 1 female, (Usinger Collection); Los Angeles, no date, P. R. Uhler, 1 male, (U. S. Nat. Museum); Palm Canyon, April 15, 1916, J. O. Martin, 1 male, (California Acad. Sci.); Palm Springs, Riverside County, April 3, 1925, E. C. Van Dyke, 1 male, (California Acad. Sci.); same place, Jan. 3, 1929, Van Dyke, 1 female, (Univ. of Kansas Coll.); same place, Aug. 2, Hubbard, 1 female, (U. S. Nat. Museum); Panamint Valley, April 1891, C. V. Riley, 2 females, (U. S. Nat. Museum); Pico, March 7, 1916, J. O. Martin, 1 male and 1 female, (California Acad.

Sci.); Pine Valley, July 27, 1938, R. I. Sailer, 1 female, (Univ. of Kansas Coll.); Santa Ana Canyon, July 12, 1931, C. H. Martin, 7 males and 3 females, (Univ. of Kansas Coll); Sierra Madre, June 7, 1930, C. H. Hicks, 2 males, (Phila. Actd. Sci.); Sierra Nevada Mountains, no date, P. R. Uhler, 1 male, (U. S. Nat. Museum).

Nevada. Warm Springs, Clark County, April 7, 1950, L. A. Rivers and V. K. Johnson, 2 males (California Acad. Sci. and Usinger Coll.).

Arizona. "Ariz.", no date, P. R. Uhler, 1 male, (U. S. Nat. Museum); "Ariz.", no date, C. F. Baker, 1 male and 1 female, (U. S. Nat. Museum).

Baja California. Big Cyn., Sierra Laguna, Oct. 13, 1941, Ross and Bohart, 2 males and 2 females, (California Acad. Sci.); Cataviñ, June 19, 1938, Michelbacher and Ross, 1 male, (California Acad. Sci.); Las Animas, Sierra Laguna, Oct. 12, 1941, Ross and Bohart, 1 male and 2 females, (California Acad. Sci.); Las Parras, Oct. 1925, W. M. Mann, 1 male, (U. S. Nat. Museum); Loreto, Feb., 1923, W. M. Mann, 2 males and 3 females, (U. S. Nat. Museum); 19 mi. E. Rosario, June 17, 1938, Michelbacher and Ross, 3 males, (California Acad. Sci.); "L. Cal.", no date, P. R. Uhler, 1 male, (U. S. Nat. Museum). *Georgia.* (?) Daytono, July 9, 1926, J. R. Delano, 2 females, (Phila. Acad. Sci.). ([2]labeled Dayton, Ga.).

FIG. 1 N. MARTINI N. SP.

FIG. 2 N. USINGERI N. SP.

FIG. 3 N. MEXICANA (MELIN)

FIG. 5 N. MARTINI N. SP.

FIG. 4 N. STYGICA SAY

FIG. 6 N. MEXICANA (MELIN)

EXPLANATION OF FIGURES

Figs. 1–4, males, claspers. Figs. 5–6, females, apical abdominal sternites.

[2] I have not been able to locate a Dayton, Georgia, a Dayton, California, or a Dayton, Guatemala.

This species is very closely related to *Nerthra mexicana* (Melin) and to *N. stygica* Say. It is separated from the former species by the narow pronotum, slightly larger size, the notch of the posterior margin of the last abdominal segment of the female being rather pointed at the anterior end (figs. 5 and 6) and by the shape of the clasper of the male (figs. 1 and 3). It differs from *N. stygica* Say in that it has separate hemelytra with well-developed membranes, the emargination of the last abdominal segment of the female slightly more pointed anteriorly, and in the shape of the male genitalia (figs. 1 and 4).

This species is named after Doctor C. H. Martin, who studied the genus *Gelastocoris* and who collected the types located in the Francis Huntington Snow Entomological Collection.

Nerthra usingeri Todd, new species

Size. Male: Length, 6.4 to 6.8 mm.; width of pronotum, 4.5 mm.; width of abdomen, 4.4 to 4.5 mm. Female: Length, 7.1 to 7.7 mm.; width of pronotum, 4.8 to 5.0 mm.; width of abdomen, 4.7 to 5.0 mm. *Color.* General overall color yellowish-brown to dark brown nearly black. Some specimens have the dorsal surface mottled with black and yellowish-brown. Ventrally slightly lighter in color than on the dorsal surface; front femora are brown, darkest basad, intermediate and hind legs yellowish-brown with dark brown rings. Abdominal segments, both above and below have light yellowish spots at the latero-caudal angles of each segment. *Structural characteristics.* Apex of head pointedly projecting, usually with a pair of sharp-pointed tubercles, all are variable in size. Pronotum with the lateral margins more or less rounded, converging anteriorly and posteriroly; widest level with the transverse furrow; posterior margin deeply sinuated at the middle before the scutellum. Scutellum large, not strongly elevated. Hemelytra with well-developed membranes, extending to or beyond the end of the abdomen; lateral margins of the embolia nearly straight for the basal half then gently curving medially. Connexivum visible to the width of pronotum. Bristles very small, short, peg-like, sparsely distributed over the body. Abdominal segments of the male asymmetrical; ninth abdominal segment small, oval, wider than long, slightly longer than eighth segment; seventh abdominal segment spatulate on right side, posterior margin of spatula flat. Ventral abdominal segments of female asymmetrical; posterior margin of last abdominal segment roundly emarginated (like *N. mexicana* [Melin], see fig. 6), a moderate tumescence on the left side, a faint tumescence on the right side of the last abdominal segment; a deep, elongate, transverse depression extending along the anterior margin of the last abdominal segment from the median line of the abdomen to the tumescence on the left side. Clasper of male (fig. 2), very distinctive, broad and flattened apically, widest near apex; aedeagal furrow visible on apical half of ventral surface, terminating before reaching apex; clasper flattened in an oblique dorso-ventral plane.

Holotype male, near Parker Dam, California, April 12, 1952, R. L. Usinger, and allotype female, wash 3.5 mi. N. Cross Roads, California, April 12, 1952, J. D. Lattin, in the collection of the California Academy of Sciences at San Francisco. One male and five female paratypes, wash 3.5 mi. N. Cross Roads, California, April 12, 1952, J. D. Lattin, in the R. L. Usinger Collection at the University of California. One male and one female paratypes, same data, in the personal collection of Mr. Lattin.

The difference in the locality of the holotype and the remainder of the specimens examined is merely a difference on the part of the two collectors in labelling the specimens. These data represent the same locality.

Closely related to *Nerthra stygica* Say, *N. mexicana* (Melin) and *N. martini* Todd. This species may be separated from *N. stygica* by the fact that the hemelytra are normal with well-developed membranes. The distinctive clasper of the male (fig 2) will separate this species from the males of *N. mexicana* (Melin (fig. 3) and *N. martini* Todd (fig. 1). The females of this species differ from the females of *N. martini* Todd in that the emargination of the last ventral abdominal segment is broadly rounded. To the knowledge of the writer it may only be separated from females of *N. mexicana* (Melin) by distribution.

A NEW HIPPOMELAS FROM CALIFORNIA

(Coleoptera: Buprestidae)

Jacques R. Helfer
Mendocino, California

Hippomelas dianae Helfer, new species

Holotype male elongate, subcuneate; aeneoviridis above and beneath; pubescence short, white, moderately dense; intervals of elytra sparsely efflorescent. *Head* moderately, coarsely, irregularly setopunctuate; eyes rather prominent; antennae inserted under conspicuous oblique ridges, eleven segmented, scape long, second segment slightly longer than broad, third segment much longer than second, serrate from fourth segment, segments four through eleven each with an area of sensory pores along outer edge, and with an intero-terminal sensory fossa, terminal segment with a distinct appendix; clypeous angularly,, not deeply emarginate; labrum bilobate, testaceous, pale. *Pronotum* broadest at base with front margin broadly arcuate, sides broadly

rounded past middle becoming sinuate to basal angles which are prominent, base narrowly sinuate at middle and more broadly sinuate at either side, coarsely, irregularly setopunctate with a few irregular levigated spaces. *Scutellum* small, rounded, depressed anteriorly. *Elytra* broadest at base, narrowing gradually to apical third, then more strongly and becoming serrate to apices which are bidentate, each elytron with five feeble costae; rather densely, finely, shallowly setopunctate. *Prosternal spine* punctate at middle between coxae but impunctate toward sides and tip, with a strong juxtacoxal submarginal setopunctate stria. *Mesosternum* divided for reception of tip of prosternal spine, meso-metasternal suture scarcely evident. *Metacoxal plates* cut off externally by a lateral lobe of the abdomen. *Abdomen* with suture between first and second segments distinct, posterior margin of third segment strongly angulate toward sides; entire surface rather densely, shallowly, irregularly setopunctate; last segment truncate at tip, incised at each side, with a feeble transverse subapical plate. *Forelegs* with tibiae curved, strongly margined below ,and denticulate internally, tarsi of all legs long and slender. *Genitalia* dark in color, rather short, with adeagus evenly narrowed and acute, parameres broadest at about two-thirds from their base, with margins rather gradually curving, not lyrate. *Length* 13 mm., width 4 mm.

Allotype female similar in all respects except larger, length 16.5 mm., width 6 mm., protibiae not denticulate internally, and posterior margins of abdominal segments two, three, and four irregularly dentate laterally. Apical segment of abdomen largely obscured by dense efflorescence.

Holotype, allotype, and some hundreds of additional specimens, many of them designated as paratypes, collected at PALM SPRINGS AND WHITEWATER, RIVERSIDE COUNTY, CALIFORNIA, mostly in July, by J. O. Martin, E. C. Van Dyke, P. D. Hurd, J. W. MacSwain, and others. They were consistently taken from *Ephedra*. Also several specimens from other desert localities which are doubtless the same species but which I have not designated as paratypes. Additional large series exist, in the collection of the University of California at Davis, etc. Type material deposited in California Academy of Science, principal series in California Academy of Sciences and the California Insect Survey, University of California.

The male genitalia easily distinguish this species from *Hippomelas planicosta* and *H. obliterata* with which it has been confused in collections.

Some specimens are considerably darker in color than the types, some (fresh specimens) densely efflorescent above, some with a faint cupreous shine. The smallest male is 11.25 mm. long, the largest female 17.5 mm. long.

I take pleasure in dedicating this interesting species to my wife Diane.

A NEW SPECIES OF ANDROLAELAPS FROM PEROGNATHUS IN SOUTHERN CALIFORNIA

(Acarina: Laelaptidae)

DEANE P. FURMAN

University of California, Berkeley

The new species of mite described in this paper represents the seventeenth species recognized in the genus *Androlaelaps* Berlese 1903. Of these, eight are known only from Africa (Zumpt and Patterson 1950, Zumpt 1950), where they are found principally on rodents of the families Muridae and Cricetidae. Two species, *A. hermaphrodita* (Berl.) and *A. karawaieni* (Berl.), were described from ant nests in Italy and Russia respectively, although the former species has been recorded recently by Turk (1946) from the nest of *Apodemus* in Ireland. *A. sardous* is also known from *Apodemus* in Sardinia.

A. impensus Eads 1952 is known only from a collection of bulbs of *Lilium* shipped from Japan. The remaining five species of *Androlaelaps* have been taken in the nearctic and neotropical realms on rodents of the families Muridae, Cricetidae and Heteromyidae. The new species described here is the third one known from hosts of the genus *Perognathus*.

Androlaelaps is closely related to the genus *Hypoaspis* Canestrini 1885, from which it is separable by the enlarged second pair of legs with calcarate femora in both sexes. The chelicerae of the female are shear-like, provided with a few teeth and a seta on the fixed digit. The coxae are unarmed, bearing neither ventral spurs nor stout spines. The genito-ventral plate of the female bears a single pair of setae. In the male the holoventral plate may be fused with or free from the anal plate. The dorsal plate is undivided.

KEY TO FEMALES OF THE AMERICAN SPECIES OF ANDROLAELAPS

1. Femoral spur of leg II with pronounced teeth. Expanded portion of genito-ventral plate not wider than space between coxae IV . . . 2
— Femoral spur of leg II smooth. Expanded portion of genito-ventral plate much wider than space between coxae IV . . . 3
2. Second pair of sternal plate setae overlapping bases of metasternal setae. Many ventral and dorsal setae long and sinuous. . . . . *sinuosa*, Furman, new species
— Second pair of sternal plate setae barely overlapping bases of third sternal plate setae Body setae not long and sinuous . . . . . *grandiculatus* Eads, 1951
3. Tarsus II with stout apical spines . . . . . *leviculus* Eads 1951
— Tarsus II without stout apical spines 4

4. Genito-ventral plate almost reaching anal plate. Sternal plate with slightly concave posterior margin . . . . . *setosus* Fox 1946
— Genito-ventral plate separated from anal plate by distance of over one-half the anal plate length. Sternal plate with truncate caudal margin . . . . . *johnstoni* Eads and Hightower 1951

Androlaelaps sinuosa Furman, new species

Female.—A large mite, measuring 1.179 mm. long, exclusive of gnathosoma, by 0.823 mm. wide. Shape broadly oval, with slight shoulders.

Dorsal plate covering most of width of dorsum but leaving unarmed the posterior tip of the opisthosoma; cephalic end of plate heavily solerotized and deflexed. Thirty-five pairs of setae on dorsal plate, characteristically long (up to 230 microns) and sinuous.

Venter—Presternal area indistinctly reticulate. Sternal plate widened posteriorly with concave margins measuring at narrowest points 114 microns long by 205 microns wide, lightly reticulate; sternal setae long and sinuate, anterior pair approximately 160 microns long arising from anterior margin of plate, second and third pairs 230 microns in length. Metasternal and genital setae sinuous, subequal to posterior sternal plate setae. Genito-ventral plate gently flask shaped, small, widely separated from anal plate. Flanking the genito-ventral plate two pairs of small narrow plates; two pairs of small metapodal plates more laterally situated as illustrated. Anal plate with broadly rounded anterior margin, posterior end terminating in a blunt tip; its usual terminal position necessitates dissection in order to observe the entire plate; adanal setae sinuous, 100 microns long; post-anal seta less than one-half as long. Uncovered area of venter bearing approximately 10 pairs of somewhat sinuous setae. Peritremal tube with supporting sclerotized plate extending from anterior border of coxae I almost to level of posterior border of coxae IV with stigma located at level midway between coxae III and IV; alary anterior extension of peritremal plate extends forward fusing with anterior tip of dorsal plate. Second pair of legs greatly enlarged, calcarate, armed with a massive femoral spur bearing strong teeth on the inner lateral margins; a small, blunt, striated spine located immediately distal to large femoral spur; patella and tibia each with a striated, sharp, stout spine bent at right angle to its axis (=lancet-shaped hair of Zumpt 1950); tarsus with two prominent, stout, terminal spines and a basal spine similar to, but smaller than, tibial spine. No other unusual features visible on legs.

Gnathosoma—typical for genus as illustrated. Capitular groove with six transverse rows, each containing seven to ten teeth. Fixed digit of chelicera with a short sharp seta and three teeth, movable digit bearing two teeth.

Male.—*Idiosoma*—1.065 mm. long by 0.823 mm. wide. Dorsum essentially as in female.

Venter with narrow, elongate holoventral plate, which has a truncate caudal border just posterior to hind margin of coxae IV, widely separated

EXPLANATION OF FIGURES

Androlaelaps sinuosa, female. Fig. 1. Venter; Fig. 2. Dorsal plate; Fig. 3. Peritreme; Fig. 4. Anal plate.

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from anal plate. Genital orifice on anterior margin of holoventral plate; all but the first of the five pairs of holoventral seate long and sinuous. Two pairs of metapodal plates visible. Anal plate and peritreme as in female. Approximately 12 pairs of setae on unarmed portion of opisthosoma. Legs as described for female.

Gnathosoma—Fixed digit of chelicera with subapical tooth; a short sharp seta located at proximal level of apical four-fifths of the fixed digit. Movable digit divided into two branches as illustrated, one opposing the fixed digit and supplied with one tooth, the other articulated at mid-length and produced as a long, sickle-shaped process. The usual basal brush of setae around the movable digit present.

Holotype female and allotype male, collected 18 October, 1953; from *Perognathus* sp. probably *fallax fallax* at PIGEON PASS, RIVERSIDE COUNTY, CALIFORNIA (Deposited in U. S. Nat. Museum). *Paratypes*. Twelve females and three males with same data as type.

The following are all from *Perognathus fallax fallax:*

Twenty-six females, 7 males, Reche Canyon, San Bernardino County, Calif., October 1, 1951; 16 females, 5 males, Reche Canyon, San Bernardino County, Calif., October 4, 1951; 9 females, 6 males, Reche Canyon, San Bernardino County, Calif., Oct. 5, 1951; 12 females, 2 males, Reche Canyon, San Bernardino County, Calif., Oct. 11, 1951; 17 females, 4 males, Reche Canyon, San Bernardino County, Calif., Oct. 12, 1951; 8 females, 4 males, Loma Linda, San Bernardino County, Calif., July 24, 1951; 6 females, 1 male, Loma Linda, San Bernardino County, Calif., July 27, 1951; 3 females, 2 males, Loma Linda, San Bernardino County, Calif., Aug. 2, 1951; 8 females, 8 males, Lucerne Valley, San Bernardino County, Calif., Nov. 7, 1953; 4 females, 1 male, Plunge Creek Canyon, San Bernardino County, Calif., Nov. 19, 1951.

Androlaelaps sinuosa is easily distinguished from all other species of the genus by the presence of very long sinuous setae on dorsal and ventral sides of both sexes. However, the most basic morphological difference displayed by this species is the widely divided holoventral plate of the male; all other members of the genus have the anal plate incorporated in the holoventral plate.

Some authorities might establish a new genus for the reception of this species. To this the author cannot subscribe, since the host affinities and combination of morphological features definitely align it with *Androlaelaps*.

Grateful appreciation is expressed to Mr. Raymond E. Ryckman of the Loma Linda School of Tropical and Preventive Medicine, who made available the specimens described in this paper.

EXPLANATION OF FIGURES

Androlaelaps sinuosa. Fig. 5. Venter of male; Fig. 6. Male chelicera; Fig. 7. Female chelicera.

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THE HOST OF MYRMOSULA RUTILANS (BLAKE)

(Hymenoptera: Tiphiidae)

During the spring of 1953, females of *Myrmosula rutilans* (Blake)[1] were taken running about the nest sites of the andrenid bee *Nomadopsis scutellaris* (Fowler)[2]. The association of the wasp with the bee was so consistent that the writer suspected the wasps of being parasitic on the bees. Females of the wasp were often observed to enter the burrows of the bee. Final confirmation did not come until June 15, when two females of the *Myrmosula* matured from cells which were taken from a *Nomadopsis* nest of the previous summer. This is apparently the first host record for a species of *Myrmosula* and so is of considerable interest. In fact, it is one of the few records that we have for any wasps of the subfamily *Myrmosinae*, the only other records being for *Myrmosa unicolor* Say, a parasite of *Tiphia* sp., *Halictus (Chloralictus) pruinosm* Robertson, *H. (C.) stultum* Cresson, and possibly *Lindenius (Trachelosimus) columbianus errans* (Fox).—Roy A. Snelling, Turlock, California.

[1] Identification verified by P. D. Hurd, Jr.

[2] Identification verified by J. G. Rozen, Jr.

NEW GENERA AND SPECIES OF ELMIDAE (COLEOPTERA) FROM CALIFORNIA

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California Department of Fish and Game, Red Bluff, California

The following new genera and species are described at this time, so that they may be included in the section on the Elmidae in a book on the aquatic insects of California soon to be published by the University of California.

Atractelmis Chandler, new genus[1]

Form somewhat fusiform, length slightly more than twice width, nearly glabrous. *Head:* clypeus distinct, slightly depressed; antennae moderately long, 1½ times width of head, 11-segmented with last three segments perceptably larger but not sharply differentiated; maxillary palpi (fig. 3) three-segmented. *Pronotum* with sides nearly straight, converging anteriorly, slightly convex at middle and flared basally; posterior margin not emarginate in front of scutellum; sublateral carinae slightly divergent anteriorly, with inner side deeply depressed basally, becoming gradually less distinct to anterior third where it disappears, connected at posterior fifth by a broad depression paralleling the posterior margin; discal area anterior to this depression evenly convex to anterior margin, with fine punctures; sides of pronotum lateral to carinae very deeply punctured or rugose. *Elytra* widest at anterior third; sides evenly elliptical to the rounded apices, except for slight angulation at posterior third; humeral angles prominent, concealing margin from above, area between them only slightly convex and continuous with depressed base of pronotum; elytra along medial line evenly curved about 90° from scutellum to apex, a little more strongly curved near scutellum; epipleura strongly narrowed from base, narrowly tapered to fine point near base of 5th abdominal sternite. *Ventral surface* with hydrofuge pile on underside of head, hypomera, epipleura, sides of thorax, abdomen, coxae and femur. Prosternum without short, broad anterior process under head.

Genotype: *Atractelmis wawona* Chandler, n. sp.

Atractelmis wawona Chandler, new species

Adult: In addition to the characters mentioned above this species may be characterized as follows: Length 2 mm., width .9 mm.; shining black above with four red spots on elytra. *Antennae* testacious to rufous at apex. *Elytra* with humeral red spot nearly reaching first stria; sutural black area widened near scutellum; subapical red spot 3 to 4 times as long as wide. parallel to side of elytron, beginning on 5th stria and ending on 2nd; elytral striae narrowly impressed medially, more broadly so laterally; punctures small medially, separated by more than their own width, to coarse laterally,

[1] Generic name derived from **atraktos** meaning spindle, referring to its fusiform shape; and **Elmis** which indicated its relationships to the other genera having elongate sublateral carinae and three segmented maxillary palpi.

separated by less than own width. *Wings:* See fig. 1. *Venter* piceous, medial portion between coxae from anterior margin of prosternum to apex of 5th abdominal segment, without tomentum, finely punctate with short, depressed hairs from each puncture. Prosternum with posterior process margined nearly to anterior margin, sides convergent posteriorly at about a 60° angle, roundly truncate at apex, depressed medially behind coxae, middle coxae nearly twice (11:6) as widely separated as hind coxae. Metasternum and first abdominal sternite marginate laterally at beginning of hydrofuge pile. Last abdominal segment with apex broadly rounded. *Legs* piceous to rufous, anterior side of pro- and mesotibia and posterior side of meso- and metatibia with patches of tomentum, tibia and tarsus with numerous additional long hairs; tarsi with apex of last segment nearly as thick as tibia, claws very large and stout, thick at base, curved 90° from base to apex. *Genitalia:* See fig. 2.

Holotype, male, SOUTH FORK MERCED RIVER near WAWONA, YOSEMITE NATIONAL PARK, CALIFORNIA, elev. 4,000 feet, 17 July 1946 (H. P. Chandler); *paratype*, male, Middle Fork, Cottonwood Creek, Shasta County, California, 24 June 1952. The holotype will be placed in the California Academy of Sciences, San Francisco. The single paratype, which was dissected to study some of the structures, will be retained in the author's collection.

This species is amply distinct to be separated generically from any other species known to the author. As a genus, it is related to *Cleptelmis ornata* (Schaf.) and *C. addenda* (Fall) and *Ampumixis dispar* (Fall) which have the maxillary palpi three segmented, the epipleura tapering to a fine point posteriorly, and many other characters of shape and sculpture. From them it can be separated in the field by its spindle shape and the elongate posterior red spot. Under magnification it may be separated by the shape of the pronotum, especially the carinae not reaching the anterior margin, and the transverse basal depression between the carinae; and the epipleura strongly narrowed from base.

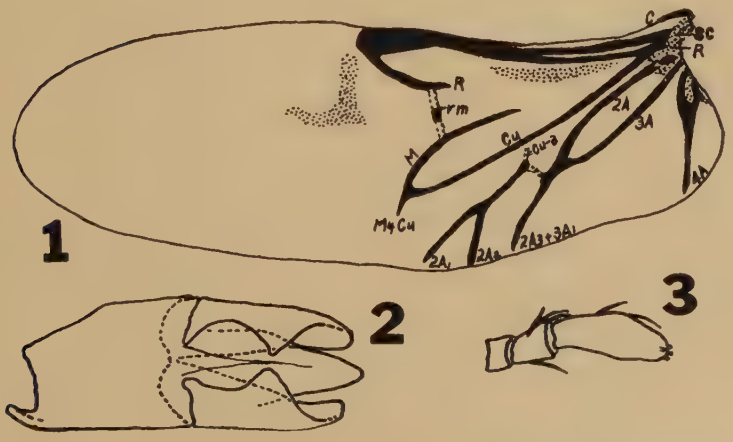
These two specimens were taken in riffle areas of a small and a medium sized clear mountain stream. The two localities are over two hundred miles apart, one in the Sierra Nevada mountains and the other in the Coast Range of Northern California. This would indicate that the species is widely distributed but quite rare, or that little collecting has been done in the exact niche it prefers.

Rhizelmis[2] Chandler, new genus

Form robust, about twice as long as wide, somewhat obovate, widest near posterior third, narrowed anteriorly to base of head, without conspicuous convexities, strongly narrowed posteriorly to blunt apices of the elytra with sides at about 70° angle, sparsely clothed with fine depressed hair above. *Head* as long as wide; clypeus distinct, slightly depressed; epicranial sutures

[2] Generic name derived from **rhiza** for root, referring to the roots and mosses which were processed in a Berlese funnel to obtain these specimens, and **Elmis**.

depressed; antennae moderately long, 1.3 times width of head, a little longer in male, eleven-segmented, with last three segments perceptibly larger but not sharply differentiated; maxillary palpi three-segmented. *Pronotum* with sides sinuate, converging anteriorly, slightly convex behind middle, slightly concave anteriorly, more strongly so posteriorly; hind angles flared; posterior margin not emarginate in front of scutellum; discal area evenly convex and finely punctured from anterior margin to posterior fifth, broken only by fine medial carina, bounded laterally by sublateral carinae; deep depression extending from anterior margin posteriorly along the lateral margin to posterior 2/5 with smaller depressions near the margin at posterior 1/5 and at posterior 1/5 of sublateral carinae; lateral fourth coarsely and densely punctured, with slightly depressed area along posterior margin also densely punctured except for two small tuberosities located medially to base of sublateral carinae; sublateral carinae nearly obscured by dense puncturing, carinae extending from posterior margin to base of domed discal area, then convexly around discal area nearly to anterior margin. *Elytra* widest near middle; sides more strongly rounded just behind middle, then somewhat flattened to the rounded apices; humeral angles only slightly prominent, area between them only slightly convex and continuous with depressed base of pronotum; elytra along medial line evenly curved about 90° from scutellum to apex, a little less strongly curved near apex; epipleura most strongly narrowed near the base of the metacoxa, narrowly tapered to a fine point just beyond base of 5th abdominal segment. *Venter* with hydrofuge pile on underside of head, hypomera, epipleura, sides of thorax, coxae and femora. Prosternum with a short, broad, anterior process under head.



Figs. 1–3. *Atractelmis wawona* Chandler, n.g., n.sp. 1. Wing. 2. Ventral view of male genitalia. 3. Maxillary palp.

Genotype: *Rhizelmis nigra* Chandler.

Rhizelmis nigra Chandler, new species

In addition to the characters mentioned above this species may be characterized as follows:

Holotype male: length 2.6 mm., width 1.3 mm.; shining black above. *Head* about as long as wide, densely covered with micropunctures and short, depressed hairs; antennae testaceous to brown at apex. *Elytra*, striae narrowly impressed, punctures small, separated by twice their own width, lateral striae and punctures a little stronger, punctures separated by more than their own width; strial intervals rugulose with scattered micropunctures. *Venter* piceous, medial portion between coxae from anterior margin of thorax to fifth abdominal segment without tomentum, but coarsely punctate and with short, depressed hairs, except metasternum which is finely punctate and nearly glabrous; prosternal process roughly triangular with bluntly rounded apex, about 1.2 times as long as wide, margins raised; mesocoxae 1.4 times as widely separated as hind coxae; metasternum with only short carinae behind mesocoxae at the edge of the tomentous area; fifth abdominal segment emarginate at apex. *Legs* rufotestaceous with thicker portions of femur piceous, all tibia have at least some tomentum on both the anterior and posterior sides. Tarsi and claws moderately enlarged. *Genitalia*, aedeagus evenly narrowed to dorso-ventrally keeled apex; parameres narrowed from basal to apical third then curved out and flared to obliquely truncate apex.

Allotype female: length 2.9 mm.; width 1.45 mm.; similar to type except antennae slightly shorter, and apex of fifth abdominal segment not emarginate. *Genitalia*, apical segment of the paired appendages three times as long as wide and about 1/3 as long as basal segment.

Holotype, male, PARADISE CREEK, COLUSA COUNTY, CALIFORNIA, 24 July 1953, elev. 2,400 feet (H. P. Chandler). *Allotype*, same data as holotype. Five *paratypes* same data as holotype. Holotype and allotype will be placed in the California Academy of Science collection, paratypes in Milton W. Sanderson's and my own collection.

The discovery of this species resulted from my attempts to collect and associate larvae with the adults of all the genera of Elmidae occurring in California. In the course of this work the larvae now associated with this species were collected from two widely separated localities. *Atractelmis* was the only known adult with which no larvae had been associated. With some misgiving the larvae were associated with *Atractelmis* since they were collected from similar habitats, and each had characters showing it to belong to the *Elmis* section of the family. The third attempt to collect adults at Paradise Creek was successful, and the correction was made.

In relation to the other genera with three-segmented maxillary palpi it is intermediate in size between *Narpus* which is larger, and *Cleptelmis*, *Ampumixis* and *Atractelmis* which are smaller. The sculpturing of the pronotum most closely approaches that of *Atractelmis*, but the general body shape is quite different. Also it may be separated from the latter by the projection of the prosternum under the head, the shape of the epipleura and the male genitalia with the flared tips of the parameres. The masking of the sublateral carinae of the pronotum by the lateral punctures will make this genus difficult to key out in a natural key unless the 3 segmented maxillary palpi, which are often difficult to count, are used near the beginning of the key.

Larva: Length 6.2 mm.; width, prothorax .75 mm., 1st abdominal segment .75 mm., 7th abdominal segment .65 mm.; long and slender with nearly parallel sides; hemicylindrical in cross section. Eighth and ninth segments narrowed to bluntly rounded, emarginate apex. Integument rufotestaceous with a fuscous tinge dorsally, especially on the tubercles; tubercles small, slightly raised, separated from each other by less than their own width except for several glabrous patches on thorax and apical half of ninth abdominal segment, each tubercle with a short, depressed posterior spine; hind margin of each segment fringed with an even row of closely spaced, elongate tubercles which appear to be bidentate posteriorly but have a short, semi-transparent spine in socket between teeth. *Head:* Antennae biramous; ocelli five, three closely placed anterior ocelli and two more widely separated posteriorly. *Prothorax* with lateral, longitudinal depression connected with transverse depression reaching nearly to medial line. *Venter:* Pleurae of promeso- and metathorax divided into anterior and posterior sclerites; anterior pleurae of prothorax separated medially by suture, sternum reduced to a small triangular sclerite between and anterior to coxae. Procoxal cavities open behind. Abdomen with pleurae on first to eight segments. Ninth abdominal segment twice as long as wide, emargination at apex obtuse V-shaped, with a short projection at lateral angles; operculum 4/9 as long as segment.

Records: Paradise Creek, Colusa County, California, 21 Sept. 1952, 12 May and 24 July 1953, elev. 2,400 feet (H. P. Chandler); Deep Creek, Shasta County, 12 Oct. 1952, elev. 2,200 feet (H. P. Chandler). M. W. Sanderson noted in a letter that he had a larva similar to one of the above sent him, from Tagoose Creek, Inyo County, California, probably collected by Tarzwell.

This larva can be separated from those of other genera by its general shape and the presence of pleurae on the eighth abdominal segment. From *Narpus* which also has 8 abdominal pleurae, it can be separated by its less cylindrical shape and the absence of short, erect spines on the vertex.

The last collection from Paradise Creek consisted of 69 specimens ranging from small to mature larvae. These were sorted into 4 size groups as follows: (16) 2.7 to 3 by .35 mm.; (13) 3.3 to 3.9 by .45 mm.; (13) 4.5 to 5 by .6 mm.; (27) 5.5 to 6.3 by .8 mm. This may indicate that the life cycle extends over 4 or more years. There was also a pronounced color change between each group from light testaceous to the black tinged mature larvae.

Optioservus canus Chandler, new species

Holotype male: Length 2.1 mm.; width .9 mm.; head, thorax and scutellum black, elytra fuscous brown with testaceous humeral spots, venter fuscous brown; entire body more or less covered with conspicuous white, depressed hairs up to .1 mm. in length, giving grizzled appearance above and even apparent ventrally where body is covered with hydrofuge pubescence. *Head* black, alutaceous above; exposed mouthparts black, maxillary palpi four-segmented. Antennae testaceous, 11-segmented, length equal to width of head, basal two segments equal, distal segments 9–11 slightly flattened, greatest width equal to that of basal segments, intermediate segments 3–8 only 2/3 as wide. *Pronotum:* Length .8 mm.; width 1 mm.; sides parallel basally, arcuately convergent anteriorly, disk finely punctured, evenly convex, basal sublateral carinae slightly divergent anteriorly, extending 1/3 of distance to anterior margin; sides of pronotum lateral to carinae rugose, lateral margin caniculate above and strongly arcuately depressed anteriorly. *Elytra* slightly wider than prothorax, widest near middle, sides subparallel to apical third, intrastrial and interstrial intervals micropunctate, slightly rugose and convex except near middle of medial suture; strial punctures deep, separated by own width or less; humeral spot reaching third striae, not sharply defined, medial portion of elytron with poorly defined lighter brown area extending posteriorly nearly to apex. *Venter:* Thorax and abdomen including hypomera, epipleura and femur covered with hydrofuge pubescence, except medially between coxae from head to second abdominal segment. Hypomera broad, sides strongly convergent anteriorly; posterior prosternal process with sides converging posteriorly, narrowly rounded apically; last abdominal segment rounded from side to side. Legs fuscous brown with tarsi rufotestaceous, patch of tomentum on anterior side of pro- and posterior side of meso- and metatibia; tibia not constricted or bent near apex; last segment of tarsi not as thick as tibia, claws moderate, curved about 90° from base to apex.

Allotype female: Length 2.5 mm.; width 1.4 mm. Similar to male except antennae shorter, only 4/5 width of head. Elytra with humeral spot less distinct, interstrial intervals more uniformly convex.

Holotype, Chalone Creek, Pinnacles National Monument, San Benito County, California, elev. 1,000 feet, 3 May 1946 (H. P. Chandler). *Allotype* same data. *Paratypes;* 1 ♂ and 1 ♀ same data as type; 1 ♂? Santa Barbara and vicinity, California, (F. E. Winters); 1 ♀ Riverside, California (F. E. Winters). Holotype and allotype will be placed in California Academy of Sci-

ences; one paratype in the collection of M. W. Sanderson and the rest in the author's collection.

This species is probably most closely related to *O. divergens* (LeConte) from which it can be separated by having the hairs of the body half again as long and more conspicuous, giving a grizzled appearance; the elytra brown with a humeral spot, instead of solid black, and strial intervals more convex. In addition to some of the above characters, it may be distinguished from *O. quadrimaculatus* (Horn) by having smaller poorly defined humeral and (if present as in the paratype from Santa Barbara) subapical pale areas which are more yellow than red.

ON SOME MALTHODES

(Coleoptera: Cantharidae)

Kenneth M. Fender
McMinnville, Oregon

Malthodes columbiensis Fender

Due to a typographical lapsus, ten paratypes were omitted from the original description of this species. These have been distributed as paratypes and as such should be considered. They were all collected by G. Stace Smith at Creston, B. C. on the following dates: May 5, 1947 (2), May 7, 1947 (1), May 14, 1948 (3), May 15, 1948 (1), May 21, 1948 (1) and May 25, 1948 (2).

Malthodes stacesmithi Fender, new species

Black, mandibles and posterior margin of the pronotum narrowly obscurely paler, elytra beyond the basal fifth, tarsi and the apices of the tibiae piceous, male last dorsals, seventh ventral and median portion of the sixth ventral flavous, pubescence cinereous, inconspicuous, fine and sparse. Length 4 mm.

Male. Head wider than the pronotum, finely sparsely punctured behind the eyes which are large and prominent, antennae broken off beyond the eighth segment in the type, second and third segments equal, the fourth slightly longer, the intermediate segments about three times as long as wide; pronotum shining, transverse, the anterior angles obliquely rounded, the sides nearly straight and parellel to the hind angles which are rounded, disc very finely sparsely punctured, a small triangular impression medially at the base; elytra extending to the apex of the fifth ventral segment, sparsely punctured basally, becoming rugose apically, the apices not appreciably tumid.

EXLANATION OF FIGURES

Fig. 1. male terminalia of Malthodes stacesmithi, ventral view. Fig .2. Same, lateral view.

Female. Similar to the male, head narrower than the pronotum, the eyes small, antennae missing beyond the second segment in the allotype; sides of the pronotum straight, converging slightly to the rounded hind angles; elytra extending to the apex of the fourth ventral segment; seventh ventral acutely triangularly notched.

Male terminalia: Ventral view (Fig. 1); sixth ventral deeply emarginate, the base of the emargination truncate, seventh ventral elongate, extending beyond the sixth by about one and a third times the length of the sixth, forked at the apical third, the forks strongly divergent, becoming parallel apically, the tips rounded, apices of the side pieces of the penultimate dorsal subtriangular. Lateral view (Fig. 2); sixth ventral obovate, seventh ventral slender, evenly sinuately ascending, the tip rounded; last dorsals somewhat arched; sides of penultimate dorsal descending, obliquely doubly folded, the folded section slightly projected at the posterior angles into podiform processes; the last dorsal concealed.

Holotype, male, BARKERVILLE, BRITISH COLUMBIA, August 12, 1950, collected by G. Stace Smith; allotype, female, same data as male type but collected August 14, 1950. Types in the Stace Smith collection.

This species falls in my group X and in the key to that group would run to *Malthodes furcifer* LeConte. The penultimate dorsal is more rudimentary than in *M. furcifer* as indicated by the sides being merely folded rather than partially abbreviated basally as in *M. furcifer*. The basal pronotal margin is narrowly pale in *M. stacesmithi* whereas the pronotal disc of *M. furcifer* has a small pale spot medially on each side.

TWO NEW SPECIES OF NOMADA, SUBGENUS GNATHIAS, FROM CALIFORNIA[1]

(Hymenoptera: Apoidea)

P. H. TIMBERLAKE

University of California Citrus Experiment Station, Riverside

Up to the present time no species of *Gnathias* has been described or recorded from California, except that Fowler, in 1899, recorded what is apparently a single species of the group as *lepida* (♂) and *bisignata* (♀), both names having been incorrectly applied. There are, however, several species of *Gnathias* resident in California, and by request I am now describing two new species to provide names for the recording of biological data.

Nomada (Gnathias) opacella Timberlake, new species

N. lepida Fowler, 1899, Ent. News, 10, pp. 159, 161, ♂ (not Cresson).

N. bisignata Fowler, 1899, *Ibid.*, pp. 159, 162, ♀ (not Say).

This is a small *Gnathias*, which differs from similar eastern species in having the abdomen comparatively dullish, with a fine obscure puncturation, and from several other western species of similar dullish aspect in having the apical depression of the tergites comparatively broad, nude, and punctureless, and in having distinct yellow maculae on the second tergite. The male differs from *N. lepida* Cresson in the entirely black scape, in the more infuscated legs and abdomen, and in having antennal joint 4 much longer than 3.

Female—Dark-reddish ferruginous, with black markings on head and thorax. Basal and lateral margins of labrum more or less yellow. Entire posterior surface of head black, except rather narrow orbital stripes that unite with a transverse band across the vertex; a large quadrate black area on face, extending from antennae to ocellar region, enclosed by red orbital stripes which have an inward-directed spur before the summit of the eyes by which the black is notched on each side, the black area usually enclosing a small red patch in front of anterior ocellus. Sutures from antennal sockets to clypeus more or less black. Mesoscutum with four red and three black stripes that are nearly equal; the lateral margins in front of tegulae also narrowly black. Sternum and sides of prothorax, area of mesopleura just beneath wings and behind tubercles, metapleura and contiguous margin of propodeum, and median stripe on propodeum, black. Red mark on pleura generally large and extending across the posterior part of mesosternum. Abdomen dark red, more or less coppery on apical depression of tergites; the base of tergite 1 broadly black, as is the concealed base of following tergites, which thus imparts a duskiness to the coloration. On each side of tergite 2 a rather small, pale-yellow spot; sometimes a pair of smaller spots on tergite 3. Antennae dark

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ferruginous, with the scape black above except toward base, and the flagellum infuscated above. Legs dark red; the coxae, except more or less at apex or on anterior side, mark at base of front and middle femora beneath, hind femora more or less on anterior and posterior sides, and hind tarsi except toward apex, black. Tegulae ferruginous. Wings smoky except for the usual clear spot beyond the submarginal and discal cells. Nervures fuscous, the stigma dull ferruginous.

Head and thorax with the usual dense, coarse puncturation; abdomen dullish; the base of tergites 2 and 3 very minutely and densely punctate, the apical depression of tergites broad, nude, and impunctate. Apex of pygidial plate rounded, sometimes slightly truncate. Scutellum weakly bilobate. Antennae moderately elongate, the middle joints of flagellum about one and one-half times longer than thick; joint 3 on short side a little more than half as long as joint 4. Apex of hind tibiae opposite spurs armed with one long, slender bristle and three progressively shorter, coarse, curved black bristles. Second and third submarginal cells broad below, the third about half as wide as the second above. Pubescence white, becoming more or less yellowish above, with long, coarse, dusky bristles intermixed on face and scape of antennae. Apical felt band of tergite 5 narrow and white. Length, 6.5–7 mm.; anterior wing, 5.5–6.1 mm.

Male—Head and thorax black. Mandibles except tips, labrum, clypeus except upper margin of disc, lateral marks slender above and reaching level of antennae, and sometimes a short postorbital line (generally restricted to small spot next to base of mandibles), lemon yellow. Thorax entirely black, or tubercles more or less reddish, and more rarely a small yellow spot on anterior part of pleura. Abdomen dull ferruginous, black and yellow; basal half of tergite 1 black, and a broad black band at the base of tergites 2 to 6 often appearing like an apical or preapical band on the preceding segment; a yellow band on tergites 1 to 6 usually narrowly interrupted on 1, broadly interrupted on 2 and 3, and sometimes more or less interrupted on 4; the yellow on tergites 2 to 6 with a more or less distinct posterior emargination on each side by intrusion of the darker ground color, these intrusions represented on tergite 1 generally by a small black, oval or roundish spot on each side; apical depression of tergites and area between the interrupted parts of bands, ferruginous. Venter with broad yellow bands. Scape of antennae entirely black; flagellum black above, more narowly toward apex, and dull ferruginous beneath. Legs black behind, rather narrowly so on front trochanters, femora, and tibiae, the hind femora dark except on upper anterior side, and the hind tibae dark except on inner side; legs otherwise ferruginous, more or less washed with yellow, especially on anterior side of front femora and tibiae, anterior side of middle femora, and at apex of the light part of hind femora and of the middle and hind tibiae; hind tarsi dark, the front pair ferruginous tinged with brown on outer side, and the middle intermediate in color. Tegulae dark ferruginous. Wings nearly as in female.

Inner orbits of eyes distinctly converging below. Antennae moderately elongate, the scape moderately swollen; joint 4 a little longer than 13 and somewhat less than twice as long as 3; joints 5 to 12 rather strongly sinuate and denticulate on outer margin beneath. Tergite 7 distinctly notched at apex. Length, 5.5–9 mm.; anterior wing, 4.5–6.5 mm.

Variation: Rarely, the yellow marks on tergite 1 reduced to small spots or the marks on tergites 1 to 4 all reduced to small lateral spots; conversely and more rarely, the yellow markings may form wide bands, very narrowly interrupted on tergite 1, incompletely interrupted on tergite 2, and entire on following segments.

Holotype female and allotype, male, BERKELEY, CALIFORNIA, on *Ranunculus californicus*, March 17, 1941 (E. G. Linsley).

The types and following paratypes in collection of Citrus Experiment Station, Riverside: 2 females, 27 males taken with the types; 1 male, Berkeley hills, March 4, 1932 (Margaret L. Cook); 1 male, 1 female, Visalia, March 29 and April 21, 1939 (F. T. Scott); 2 females, Pine Flat, near California Hot Springs, flying over ground, May 3, 1947 (Timberlake); and 1 female, Laguna Mountains, San Diego County, May 17, 1948 (Crickmer). Paratypes in University of California collection, Berkeley, as follows: 1 female, Orinda, Contra Costa County, on *Ranunculus*, March 21, 1946 (R. Smith and MacSwain); 1 male, Berkeley, March 16, 1939; and 5 females, 42 males, Berkeley (J. W. MacSwain), collected April 15 and 19, 1946; March 11, 13, 16, 1947, and March 21, 25, 26 and April 3, 1952.

Nomada (Gnathias) debilis Timberlake, new species

Allied to *opacella*, with which it agrees closely in sculpture, but smaller and having antennae of both sexes considerably shorter.

Female—Clear dark ferruginous ,with the following black markings: a dot in suture on each side of clypeus; mark between and extending a little above antennal sockets; transverse mark covering ocelli; large area on occiput (leaving genae broadly red); prosternum and mark on sides of pronotum; median stripe on mesoscutum (and sometimes a short stripe on each side); small spot on middle of propodeum; depressed areas below and behind wings; metapleura more or less and contiguous anterior margin of sides of propodeum, with an extension to area between middle and hind coxae on each side; base of front coxae, middle coxae except apex, and posterior side of hind coxae except apex. Hind femora slightly infuscated beneath, and hind basitarsi more or less fuscous on outer side. Antennae uniformly light ferruginous. Mandibles rufous at apex. Abdomen clear ferruginous, with extreme base of tergite 1 slightly blackened. A small yellow spot on each side of tergite 2, and sometimes traces of lateral spots on tergite 3. Tegulae and wings as in *opacella*, except that the stigma is more infuscated.

Structure, sculpture, and pubescence about as in *opacella*, but head more transverse and antennae considerably shorter, with joint 3 three-fourths to four-fifths as long as 4, and the middle joints of flagellum not more than one and one-third times longer than thick. Length, 5–6.5 mm.; anterior wing, 4.5–5 m..

Male—Head and thorax black. Genae at anterior end of eyes, mandibles except reddish tips, labrum, and broad band across anterior border of face,

extending very narowly upward on orbits to level of antennae, pale yellow (the black of face more or less evenly truncate anteriorly and covering base of clypeus). Two red spots on scutellum, sometimes enlarged and confluent, and sometimes a small red spot on each side of hind margin of pronotum. Tubercles ferruginous or yellow or tipped with yellow, and a small yellowish mark on anterior border of the sternopleural region of mesothorax on each side. Abdomen clear ferruginous, except that the base of tergites 2 to 7 is black, imparting a duskiness to the overlying portion of preceding segment, and nearly the basal half of tergite 1 is black. A moderately large, nearly circular yellow mark on each side of tergite 2, smaller marks on tergite 3, and usually a small yellow spot on each side of tergite 4. Legs ferruginous, but the coxae almost entirely, posterior side of trochanters and of hind femora, under margin of front and middle femora and outer side of hind basitarsi, black; front and middle tibiae a little infuscated behind. Antennae ferruginous, but scape black, either entirely or often with a yellow or reddish stripe beneath; first four joints of flagellum broadly, and the following joint to apex narrowly, black above. Tegulae and wings as in female.

Other characters about as in male of *opacella*, except that the antennae are considerable shorter; antennal joint 4 equal to 13, and joint 3 on its short side about two-thirds as long as 4; middle joints of flagellum about one and one-third times longer than thick. Length, 5–6.5 mm.; anterior wing, 4.5–5 mm.

Holotype female and allotype, Tetley Park, Seeley Flat, San Bernardinno Mts., California, about 4,500 feet. at flowers of apple, May 15, 1937 (Timberlake). Paratypes as follows: 12 females, on *Potentilla glandulosa*, May 13, 1934; 3 females on same flowers, May 23, 1936; 2 females on *Ceanothus integerrimus*, May 16, 1936; 1 female, 13 males at flowers of apple, 1 male on *Salix laevigata*, 2 males on *Montia perfoliata*, and 8 males on *Nemophila integrifolia*, May 15, 1937; 2 males flying over ground and 3 males on *Nemophila integrifolia*, May 8, 1940 (Timberlake); and 1 female, May 8, 1940 (C. M. Dammers), all at type locality; 1 male, Mill Creek, San Bernardino Mountains. 6,000 feet, on *Ceanothus cordulatus*, May 20, 1946; and 1 male same locality, on *Arctostaphylos patula*, May 16, 1948 (Timberlake). Types in collection of Citrus Experiment Station, Riverside.

Var. a. — Female with black markings nearly extensive as in *opacella*, with the red forming a band across upper part of frons; the legs and abdomen clear red, but the black forming three stripes on mesoscutum; a median stripe or propodeum, and a broad oblique band from hind wings to middle and hind coxael (Sierra Nevadas). 1 female, Miami Ranger Station, Mariposa County, June 4 and 7, 1942 (E. G. Linsley); and 1 female, Oakhurst, Madera County, on *Ceanothus*, June 5, 1942 (Arthur J. Walz).

A NEW SPECIES OF GLUTOPS AND OTHER NEW RECORDS OF CALIFORNIA TABANOIDEA

(Diptera)

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Through the courtesy of Dr. Paul D. Hurd, Jr., I have had the pleasure of examining a collection of Rhagionidae and the related families Erinnidae and Coenomyiidae from the California Insect Survey at Berkeley. In all 30 species and 540 specimens were represented. The most important records are presented here, together with a few distributional and descriptive notes. I am also greatly indebted to Dr. Frank R. Cole of Redlands, California, for the opportunity to study some specimens from his collection of the very rare genus *Glutops*, including a new species here described. Mr. Alexander A. Hubert of Hamilton, Montana, gave me the benefits of his intensive study of *Symphoromyia* on points of synonymy just as this paper was going to press. I also wish to thank Dr. L. L. Pechuman of Lockport, New York for his critical comparisons, loans of specimens, and other valuable assistance.

FAMILY COENOMYIIDAE

Genus Glutops Burgess

Glutops Burgess, 1878, Proc. Boston Soc. Nat. Hist., 19: 321 (Genotype: *Glutops singularis* Burgess, monobasic).

The genus *Glutops* has interested dipterists generally because specimens are rare in collections, and because the face has on each side a peculiar bulbous prominence which is especially swollen and covered with long hairs in the males. Only two species have previously been known, each from only a few specimens. One of these species was represented in the California material examined, as well as a third undescribed species.

Glutops rossi Pechuman

Glutops rossi Pechuman, 1945, Canad. Ent., 77: 134.

This species has previously been known only from British Columbia (type locality: Port Haney) and Montana. I have examined the following specimens from California:

1 ♀ Pine Creek, Modoc County, July 18, 1948, W. W. Wirth (el. 7000 ft.) (in U. S. National Museum); 1 ♂, Point Reyes, Marin County, June 5, 1949, R. E. Ryckman (U. S. N. M.); 1 ♀, Lone Pine, Inyo County, July 28, 1940, L. J. Lipovsky (Kansas Univ. collection); 1 ♂, Mt. Home Canyon, June 8, F. R. Cole (Cole collection).

Glutops punctata Wirth, new species

Female. Length 10 mm., wing 10.4 mm. by 2.6 mm.

Head pearly gray pollinose; frons 0.43 times as broad as greatest width of head across eyes in dorsal view; ocellar triangle about equilateral, on a very prominent tubercle, the distance from the anterior ocellus to bases of antennae about 0.4 of width of frons. Facial prominences not quite as strong as in *G. singularis* Burgess, with much denser, coarser, black hair. Palpi orange yellow, nearly as long as antennae, apices abruptly bent downwards, each with a flattened, bare dorsal area, and not broader than basal portions. Labium brownish and expanded in a distally flattened, ovoid disc apparently suitable for use as a suction cup in feeding. Antennae with first and second segments pruinose buff-colored, with numerous long, stout, black hairs; combined lengths of first two segments 0.7 of length of third segment. Third segment with nine indistinct annuli, basal annulus concolorus with preceding segments, second to fifth bright orange, very little broader than basal segments, sixth and succeeding annuli jet black and slender. *Thorax* pruinose gray, appearing mottled due to minute black punctations at bases of the numerous, strong, black hairs over all surfaces. Three very narrow, indistinct, black, longitudinal vittae on dorsum. Legs reddish brown, coxae with dense, dark gray pollen. Legs with very short black hairs except those on coxae, those in a ventral tuft at apex of each fore trochanter, and those on posteroventral surface of all femora, which are long. Wings with membrane reddish brown infumated, the veins very little darker. Halteres with yellowish stems, grayish brown knobs. *Abdomen* pearly gray pollinose, with vestiture of coarse black hairs, each hair with a strong, rounded, black spot at base, these spots usually broader than the distances across the intervening gray ground color between them. Base of third tergite with a mesal row of about fifteen small, oval, polished black sensory pits in a transverse depression, posterior tergites and sternites each with a few scattered pairs of similar sensoria as in the genotype. Sixth and succeeding segments greatly compressed and telescoped and yellowish brown in color.

Male. Specimen badly damaged, third antennal segments and abdomen missing. As in the female with the usual sexual differences, the most striking consisting of the enormously swollen facial prominences and the greater length of the body hairs, the facial prominences and scutellum appearing especially hirsute, but not nearly so much as in *G. singularis*. Eyes broadly contiguous above. Mesonotum darker slate-colored gray, the vittae very faint. Wing 10.0 mm. by 2.3 mm.

Wirth, new species

Holotype ♀, Fallen Leaf Lake, Lake Tahoe, California, July 2, 1915, E. C. Van Dyke (deposited in the California Academy of Sciences). *Allotype*, Agassiz, British Columbia, June, 1915, R. C. Treherne (F. R. Cole collection). *Paratypes* 1 ♀, Homestead Inn, Mt. Hood, Oregon, June 30, 1927, E. C. Van Dyke (deposited in U. S. National Museum); 1 ♀, Trinity County, California, May 27, 1934, T. G. H. Aitken (California Insect Survey collection);

1 ♀, Yeomatt, Washington, June 3, 1929, V. Tartar (C. E. Philip collection).

The Agassiz, British Columbia, specimen was originally reported by Gibson (1916, 47th Ann. Rept. Ent. Soc. Ontario, p. 154) as *G. singularis* Burgess, but Pechuman (l.c.) not being able to locate the specimen, was naturally inclined to believe that it probably referred to his western species *G. rossi*. *G. singularis* has been recorded only from the northeastern states of New Hampshire, Massachusetts, Connecticut, New York and Pennsylvania. I am indebted greatly to Dr. Pechuman, to Dr. Marion E. Smith of the University of Massachusetts, and to Dr. C. H. Curran of the American Museum of Natural History for the loan of five female specimens of *G. singularis* for comparison with my western species, thus enabling me to study both sexes of each of the three species together. I am therefore able to present the following key for their separation:

KEY TO THE SPECIES OF GLUTOPS

1. Antennae and legs black, halter knobs whitish, mesonotum with broad, dark gray vittae; wings with veins dark colored; length about 6 mm. ..... *rossi* Pechuman
— Antennae yellowish to orange at bases, only extreme apices black; legs reddish brown; halter knobs infuscated; mesonotum with narrow dark brown or black vittae; length 8-10 mm. 2
2. Body hairs coarse, each arising from a round black dot; wing membrane dark brown, concolorous with borders of veins; mesonotal vittae black; antennae with first two segments combined half as long as third segment, the latter not swollen in middle; ocellar triangle equilateral; length 10 mm. ..... *punctata* Wirth
— Body hairs fine, not arising from black dots, the body rather uniformly pollinose gray; wing membrane pale, contrasting strongly with dark brown-bordered veins; mesotonal vittae brown; antennae with first two segments combined over two-thirds as long as third segment, the latter considerably swollen in middle; ocellar triangle longer than broad; length 8 mm. ..... *singularis* Burgess

FAMILY RHAGIONIDAE

GENUS VERMILEO MACQUART

VERMILEO OPACUS (Coquillett)

Vermileo opacus (Coquillett), 1904. Inv. Pac. 1:21 *(Pheneus)*; Swezy, 1929, Proc. Hawn. Ent. Soc. 7:231; Leonard, 1930, Amer. Ent. Soc. Mem. 7:32; Pechuman, 1938, Bull. Brooklyn Ent. Soc. 33:84.

Coquillett described *V. opacus* from a male from Ormsby County, Nevada; Leonard added a record from Alamogordo, New Mexico; and Pechuman described the female from Pasadena, Cali-

fornia and added a record from Zion Canyon, Utah. In the U. S. National Museum there is a female of *V. opacus* collected at Yosemite, California, at 3000 feet altitude by W. M. Wheeler which had been determined by him as *V. comstocki*. I have also seen a male and female from the Calfornia Insect Survey, taken at Snowline Camp, Eldorado County, California, July 22, 1948, by J. W. MacSwain.

VERMILEO COMSTOCKI Wheeler

Vermileo comstocki Wheeler, 1918, Proc. N. England Zool. Club 6:83; Greene, 1926, Proc. U. S. Nat. Mus. 70:12; Leonard, 1930, Amer. Ent. Soc. Mem. 7:71; Leonard, 1931, Trans. Amer. Ent. Soc. 57:323; Pechuman, 1938, Bull. Brooklyn Ent. Soc. 33:87.

Wheeler collected his type series of *V. comstocki* at Alta Meadow, near Sequoia National Forest, California, elevation 9000 feet. Pechuman gives the location of the holotype as the Museum of Comparative Zoology at Cambridge, Massachusetts; there are five specimens labelled as cotypes in the U. S. National Museum. I have also examined 1 male, Sentinel Dome, California, June 19, 1938, E. O. Essig, elevation 8117 feet (California Insect Survey), 1 female, same data (U.S.N.M.), and 1 female, Strawberry, Tuolumne County, California, July 15, 1951, J. W. MacSwain (C.I.S.). All the known localities for *V. opacus* are at an elevation indicating an Upper Sonoran distribution, while the *V. comstocki* localities are Transition or above.

GENUS SYMPHOROMYIA FRAUENFELD

This genus is especially important as it contains the only blood-sucking members of the family Rhagionidae in North America. In the mountains of the northern and western parts of the country these biting snipe flies are as annoying and painful biters as members of the Tabanidae. Aldrich's (1915, Proc. U. S. Nat. Mus. 49:113–142) revision of the North American species still stands as the authoritative work and although excellent, badly needs to be brought up to date with a study of the male genialia. Species reported by Aldrich to take blood include *atripes* Bigot, *flavipalpis* Adams, *hirta* Johnson, *inquisitor* Aldrich, *pachyceras* Williston and possibly *kincaidi* Aldrich. I captured a female of *sackeni* Aldrich (near Saratoga, Santa Clara County, California, July 8, 1948) in the act of biting painfully.

I have identified the following California species of *Symphoromyia* in the California Insect Survey collection.

1. *atripes* Bigot. 78 ♀♀, Echo Lake, Eldorado County; Delany Creek,

Yosemite; White Mountain, Inyo County; Gaylor Lakes, Yosemite; Hope Valley, Alpine County; Young Lakes, Yosemite.

2. *fulvipes* Bigot. 34 ♀♀, Hat Lake, Lassen County; Donner Pass, Nevada County; North Park, Mirror Lake, Young Lakes, Yosemite; Echo Lake, Eldorado County; Hope Valley, Alpine County; Buck's Lake, Plumas County; Mt. Raymond, Madera County; Tuolumne Meadows, Tuolumne County; Dark Creek, Tahquitz Valley, Idyllwild, San Jacinto Mountains. [I believe that *flavipalpis* Adams from Utah, which apparently differs mostly in its darker femora, will eventually prove to be a synonym of *fulvipes*, while *hirta* Johnson, with a much narrower frons and broad mesotonal bands should be restricted to the eastern form. All of Aldrich's Rocky Mountain records of *hirta* should be transferred to *flavipalpis*].
3. *johnsoni* Coquillet. 2 ♂♂, 25 ♀♀, Keen Camp and Pine Grove, San Jacinto Mountains; Echo Lake, G. Alpine Creek, Lake Forest, Tahoe; Spaulding's, Lassen County; Buck's Lake, Plumas County; Miami Ranger Station, Mariposa County.
4. *kincaidi* Aldrich. 1 ♀, Mirror Lake, Yosemite, July 20, 1936, W. G. Herms.
5. *limata* Coquillet. 108 ♀♀, Idyllwild, Ribbonwood, Keen Camp, Pine Grove, Santa Rosa Mountain, Herkey Creek, San Jacinto River, San Jacinto Mountains; Tanbark Flat, Camp Baldy, Van Nuys, Pasadena, Los Angeles County; Poppet Flat, Riverside County; Hastings Refuge, Monterey County; Portola State Park, San Mateo County.
6. *montana* Aldrich. 22 ♂♂, 3 ♀♀, Hope Valley, Alpine County; Bridge Creek Camp, Lassen County; Triple Peak Fork, Yosemite; Sardine Creek, Mono County.
7. *pachyceras* Williston. 4 ♂♂, 23 ♀♀, Mt. Hamilton and San Antonio Valley, Santa Clara County; Cypress Ridge, Lagunitas Creek, Marin County; Sunol, Alameda County; Ryan Creek, Mendocino County; Hat Creek, Shasta County; Echo Lake, Eldorado County; Young Lakes, Yosemite.
8. *plagens* Williston. 4 ♂♂, 6 ♀♀, Trinity County; Donner Pass, Nevada County; Green Valley Park, Solano County; China Flat, Echo Lake, Eldorado County; Strawberry, Tuolumne County; Mt. Raymond, Madera County; Frazier Mt., Kern County.
9. *sackeni* Aldrich. 5 ♂♂, 92 ♀♀, Pine Grove, San Jacinto River, Idyllwild, Dark Creek, San Jacinto Mountains; Tanbark Flat, Big Dalton Dam, Pasadena, Los Angeles County; Loma Prieta, Santa Clara County; Frazier Mountain, Kern County; Davis, Yolo County; Pepperwood, Scotia, Yosemite.
10. *securifera* Coquillett. (see below 13 ♀♀).
11. *varicornis* (Loew). 4 ♀♀, Phoenix Lake, Taylor State Park, Marin County; Oak Grove, San Diego County.

Of the above listed species, Aldrich did not include California records of *fulvipes* and *montana*, and the present records are thus apparently new for the state. However, Aldrich listed the following

species from California, *cinerea* Johnson, *cruenta* Coquillett, *pilosa* Aldrich and *trucis* Coquillett, which I did not find in the Survey collection.

SYMPHOROMYIA SECURIFERA coquillett

Symphoromyia securifera Coquillett, 1904, Proc. Ent. Soc. Wash. 6:171; Aldrich, 1915, Proc. U. S. Nat. Mus. 49:140.

SPECIMENS EXAMINED: 12 ♀♀, Tanbark Flat, Los Angeles County, California, June 20, 1950, J. W. MacSwain; 2 ♀♀, same locality, June 20 and 25, 1950, P. D. Hurd (in collections of U.S.N.M. and California Insect Survey).

Aldrich's description of *securifera* from a female collected by Osten Sacken in Sonoma County, California, differs so much from the type female described by Coquillett from Santa Clara County, that I believe it advisable to redescribe the species again based on fresh material. The type agrees with these Tanbark Flat specimens except that the legs are, as described by Aldrich, mostly yellow. Aldrich's figure 11[2], allegedly of the mid coxa of *securifera*, is referred by him in his later notes to *johnsoni*. This clump of modified black spines on the outer side of the mid coxa is found, as stated earlier in Aldrich's paper (p. 114) in males of several species in the group with a concave third antennal segment.

Female. Length 5.7 mm. Front half as wide as one eye, densely gray pollinose, with rather long, coarse, black pile; slightly bulging on each side below ocellar triangle, the latter on prominent elevation. First antennal segment pollinose gray, short and slightly swollen, with coarse black pile; second segment less than a fourth as long as first; third segment pubescent black, concave below the black arista, much elongated below, its length equal to length of entire antenna to base of arista. Face bare, grayish-white pollinose; palpi orange-yellow, broad beyond middle, with whitish pile; labellae fleshy, blackish; beard white.

Mesonotum densely gray pollinose, with coarse black pile rather short except long in front of scutellum; with three very marked brownish-black longitudinal vittae, the median vitta very narrow, the gray areas between this and lateral vittae subequal in breadth to that of the latter. Scutellum gray, with long black pile; pleura finely gray pollinose, with very fine whitish pile, propleura and metapleura with dense long white pile. *Legs* black; coxae gray pollinose, with dense white pile, mid coxae without spine-like clump of bristles; femora with very fine, short, white pile mixed with black pile on fore legs; fore and mid knees yellowish; fore and mid tibiae brownish; tarsi black. *Wings* grayish hylaine, veins dark brown, becoming yellowish at base of wing. Haltereas entirely yellow. *Abdomen* densely gray pollinose, tergites each with a rather elongated, median, brownish spot, those on posterior segments usually somewhat broader and less distinct; pile on first tergite and on venter white, on distal tergites black and coarse.

[2] Likewise Aldrich's figures 4 and 5, p. 130, should refer to **sackeni** Aldrich, and not, as labeled, to **kincaidi** Aldrich.

THE TAXONOMIC STATUS OF OLIGOTYLUS VAN DUZEE AND LEPTOTYLUS VAN DUZEE, WITH THE DESCRIPTION OF A NEW SPECIES OF PSALLUS

James A. Slater[1] and Harry H. Knight[2]

E. P. Van Duzee (1916) in his synoptic keys to the genera of North American Miridae described three new genera of the subfamily Phylinae for which no species were included. These genera were *Strophopoda*, *Oligotylus* and *Leptotylus*. Van Duzee assumed that these generic names were invalid in the above mentioned paper and noted that he intended to validate them later by the publication of included species. He did this, however, only in the case of *Strophopoda*[3] by the description in 1921 of *Strophopoda aprica*. This species becomes the type species of *Strophopoda* by subsequent designation. In the cases of *Leptotylus* and *Oligotylus*, no species have been included in these genera. Opinion 46 of the International Rules of Zoological Nomenclature establishes the principal that genera described without the inclusion of any species are valid. *Leptotylus* and *Oligotylus* therefore must be considered validly establish genera. It seems essential that type species be assigned to these generic names so that a type species inadvertently or accidentally assigned may not cause the synonymy of well known generic names proposed subsequent to 1916.

Dr. E. S. Ross of the California Academy of Sciences has kindly checked the Van Duzee collection of Miridae in an attempt to locate specimens bearing labels of either of these genera. Five specimens under the name *Oligotylus* have been located and prove to pertain to a new species of *Psallus* described below. We hereby designate as type species of *Oligotylus* Van Duzee, *Psallus brevitylus* new species. *Oligotylus* Van Duzee 1916 is therefore a junior synonym of *Psallus* Fieber 1858.

In the case of *Leptotylus*, no specimens under this name appear to be present in the Van Duzee collections. The type species of *Leptotylus* Van Duzee is here designated as *Microphylellus longirostris* Knight. This is a species that agrees in all essentials with the generic description of *Leptotylus*. *Leptotylus* Van Duzee 1916 is therefore a junior synonym of *Microphylellus* Reuter 1909.

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[3] Carvalho (1952) dates **Strophopoda** from 1921, but as noted above the genus should actually date from 1916.

Psallus brevitylus Slater and Knight, new species

General coloration black, second antennal segment and extreme apex of first segment light tan, second segment becoming darker brown on apical one-third, segments three and four dark brown; thoracic pleura narrowly margined with testaceous to dull white; femora dull testaceous marked with a series of large prominent, black spots and armed with conspicuous black spines; thickly clothed with decumbent, sericeous, flattened hairs, these interspersed with semierect blackened hairs, the latter abundant and conspicuous on upper surface of head.

Head strongly declivent, much more abruptly so than in *nigerrimus*. Width across eyes .81 mm. (.78-.85), interocular space .43 mm.; rostrum short, length .85 mm., attaining posterior margin of mesosternum, basal segment subequal to length of first antennal segment, length of this basal segment .21 mm.; length antennal segments, I .21 mm., II .92 mm., III .58 mm. (.50-66), IV .31 mm. (28-.33). Length pronotum .71 mm., width pronotum 1.25 mm. (1.14-1.28)), length scutellum .61 mm. (57-.64). Lateral margins of corium moderately and evenly rounded, membrane exceeding apex of abdomen by distance caudad of apex of cuneus. Total length 3.51 mm. (3.27-3.69); maximum width across hemelytra 1.50 mm. (1.35-1.56).

Holotype: Male, San Diego County, California, 5-20-13 (E. P. Van Duzee). In California Academy of Sciences collection. Allotype: San Diego County, California, 6-8-13 (E. P. Van Duzee). Same deposition as holotype. Paratypes: 3 males, same date as holotype and allotype. Deposited in the California Academy of Sciences and private collections of the authors.

This new species is most closely related to *nigerrimus* (Van Duzee) with which species it agrees in coloration and particularly by the possession of the large black tibial spots and spines. It may readily be separated from *nigerrimus* by the much shorter rostrum that reaches only to the posterior margin of the mesosternum, whereas in *nigerrimus* the rostrum reaches or slightly exceeds the posterior coxae. In *nigerrimus* the basal segment of the rostrum is considerably longer than the first antennal segment (.36 to .21) whereas in *brevitylus* the two are subequal. In *brevitylus* the second antennal segment is light brown rather than black, the interocular space somewhat broader (*brevitylus* .43 mm., *nigerrimus* .36-.39 mm.), the black semierect hairs on the head more numerous and extending further anteriorly on the frons. The shape of the anterior portion of the head shows considerable difference in the two species being more strongly declivent in *brevitylus* and as a consequence less strongly produced forward.

The authors wish to thank Dr. E. S. Ross of the California Academy of Sciences for his kindness in locating hte specimens of *Psallus brevitylus* in the Van Duzee collection.

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RECORDS OF EXOMALOPSIS SIDAE IN CALIFORNIA AND BAJA CALIFORNIA

(Hymenoptera: Anthophoridae)

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During the summer of 1953, the author had the opportunity of collecting bees in Imperial County, California and the adjacent Mexicali Valley, Baja California, Mexico. During the six weeks of collecting spent in that area, the author collected quite a number of a small species of *Exomalopsis* which was presumed to be *E. rifiventris* Timberlake. However, when the author examined his collection and papers it was found to be *Exomalopsis sidae* Cockerell. In his recent revision of *Exomalopsis*,[1] Timberlake states that *E. sidae* is known only from the Mesilla Valley, New Mexico. However, there seems to be little doubt that this is the same species, as the specimens collected by the author agree perfectly with New Mexico specimens.

The revised distribution of *Exomalopsis sidae* Cockerell should now include Arizona, California, and Baja California, Mexico. New distributional data are as follows:

Arizona: 1 ♂, Tucson, June 16, 1951 (E. O. Johnson), on *Sphaeralcea*. California: 1 ♂, 2 ♀♀, 1 mi. E. Calexico, Imperial Co., June 28, 1953 (R. R. Snelling), on *Sida hederacea*. Baja California, Mexico: a total of 13 females, 5 males from the following areas, from June 29 to July 17; 36 k. S. Mexicali, 7 k. NE. La Puerta, 12 k. SW. Mexicali, and Ejido Campeche, females on *Sida hederacea*, two males on *Gossypium*, all collected by the author.

[1] Timberlake, P. H. 1947. Jour. New York Ent. Soc., 55: 85-106.

MONODONTOMERUS MONTIVAGUS ASHMEAD, A PARASITE OF MEGACHILE CENTUNCULARIS (LINNAEUS)

(Hymenoptera)

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For many years the leaf cutting bee, *Megachile centuncularis*, has used the guide mechanism of a casement window in the home of the senior author in Berkeley, California, as a nesting site. Although there six similar windows, only the one has been consistently used. The groove of the metal guide is about 8 inches in length and has a diameter just sufficient to accommodate the cells. Then entire length of the groove is utilized in much the same manner as the insect makes use of a hollow stem. Of course, if the window is opened, the cells are crushed by the runner. However, if the window is only partly opened, a good portion of the cells can be removed without injury.

During the 1953 nesting season, the bees were especially ambitious, and after filling the groove with cells, the female in one manner or another constructed another series of cells along side of the metal groove. About March 15, 1954, the cells outside of the groove were examined. An end cell was broken open and it was found to be parasitized. The rest of the cells were held, and parasites emerged from five out of nine in the series.

The parasite was *Monodontomerus montivagus* Ashmead. This is the first record of this parasite being reared from the genus *Megachile*. Muesebeck, *et al*, (1951)[1] listed the known hosts of this parasite as follows: *Choristoneura fumiferana* (Clem.); *Anthidium emarginatum* (Say); *Dianthidium pudicum* (Cress.); *D. pudicum consimile* (Ashm.); *Osmia cordata* Robertson; *Anthophora abrupta* Say; *Anthophora linsleyi* Timb.; *A. occidentalis* Cress.; *Melissodes* sp.; and *Xylocopa orpifex* Smith.

As a matter of speculation, it is possible that cells constructed in the metal groove are protected from the parasite, while those which were built outside the groove were freely exposed to parasitism.

[1] Hymenoptera of America North of Mexico—Synoptic Catalog. United States Department of Agriculture. Monograph No. 2:1-1420. 1951.

FLIES ATTRACTED TO DECOMPOSING LIVER IN LAKE COUNTY, CALIFORNIA

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Various species of flies visiting decomposing organic materials are considered to be of economic importance. *Phormia ragina* (Meig.), *Phaenicia* spp., and *Callitroga macellaria* (F.), which breed in carrion, causes myiasis in soiled and moist wool of sheep. In addition, *P. regina* is an invader of wounds in warm-blooded animals and can be described as an obligatory necrobiot. These flies, as well as other species, cause damage by ovipositing on meat in abbatoirs, markets, and homes. Mechanical contamination of foods and the distribution of noxious bacteria and viruses to human food by these insects have long been considered to be of public-health importance.

It is not generally recognized that, even though blow flies are enemies of man and animals, they are also of great benefit to mankind because they destroy dead animals and thus prevent unsanitary conditions. Without blow fly larvae to reduce and destroy the vast number of carcasses of wild and domestic animals an unsightly and odoriferous condition would prevail. Blow fly larvae can be prevented from developing in an animal carcass by spraying it with DDT, lindane, or other insecticides, but the stench from the carcasses is noxious and long-lasting.

From 1938 through 1941 a study was made of the seasonal and relative abundance of the insects caught in a liver-baited trap in Lake County, California. The trap was a cone-type, screen-wire device (17 by 24 inches), almost identical with traps used by Parrish and Cushing (1938). It was set 4 feet above the ground in partial shade about 30 feet from the shore of Clear Lake, near the town of Nice. This locality has an elevation of 1300 feet and is surrounded by mountains of the intercoastal range, some of which rise to an altitude of 4100 feet. The Sacramento Valley, with an elevation of 100 feet, lies approximately 50 air-line miles toward the east.

On approximately the first and fifteenth day of each month the flies were removed from the trap and weighed, the volume determined, and the number of each species or genus ascertained in a random 10-gram sample. A total of 78 collections containing

844 quarts of flies was made. The data obtained have been summarized by months in Figure 1. Weather records from the official Weather Bureau station at Upper Lake, located 5 miles from Nice, were studied in relation to fly abundance.

Phormia regina. This was the most abundant species throughout the spring, summer, and fall months. It accounted for about 40 to 88 per cent of the total flies taken during any month except in the winter. The greatest number caught during one month was 429,000 in May 1940. The total volume of all flies caught during this month was 76 quarts. Breeding conditions were ideal during the spring, with above-normal temperatures during most of May. This species was caught every month except December 1939 and December and February 1941, when cold, wet weather prevented fly activity.

In Figure 1 it will be noted that the three most abundant species —*Phormia*, *Phaenicia* spp., and *Callitroga macellaria*—are projected on a scale that is only one-fifteenth that of the other species. This was necessary in order to accommodate the data on one figure.

Phaenicia spp.—These species were taken in most of the trapping periods except during the winter. They accounted for approximately 3 to 18 per cent of the flies caught during the warmer portion of the year.

Callitroga macellaria (the secondary screw-worm fly) and *C. hominivorax* (Coq.) (the screw-worm fly). These were the most interesting flies encountered in this study. *C. hominivorax* is the primary species causing myiasis in warm-blooded animals. Neither of these species is indigenous to the area, but *C. macellaria* was caught every summer, whereas *C. hominivorax* was taken in only one season during the four years. The latter is a comparatively rare fly even in areas of high screw-worm incidence; the proportion of this species to *C. macellaria* in trap catches may be one to several hundred or thousand.

Neither species has a true hibernating stage. Declining temperatures in the fall and winter either destroy all stages or lengthen the developmental period so that mortalities are high (Parrish 1945, Lindquist 1945). As the weather becomes warmer in the spring, the species migrate from areas in which they survived the winter. Mean temperatures of 49° to 54° F. for about three months have been found to destroy these species (Parman 1945, Lindquist 1945, Parrish 1945).

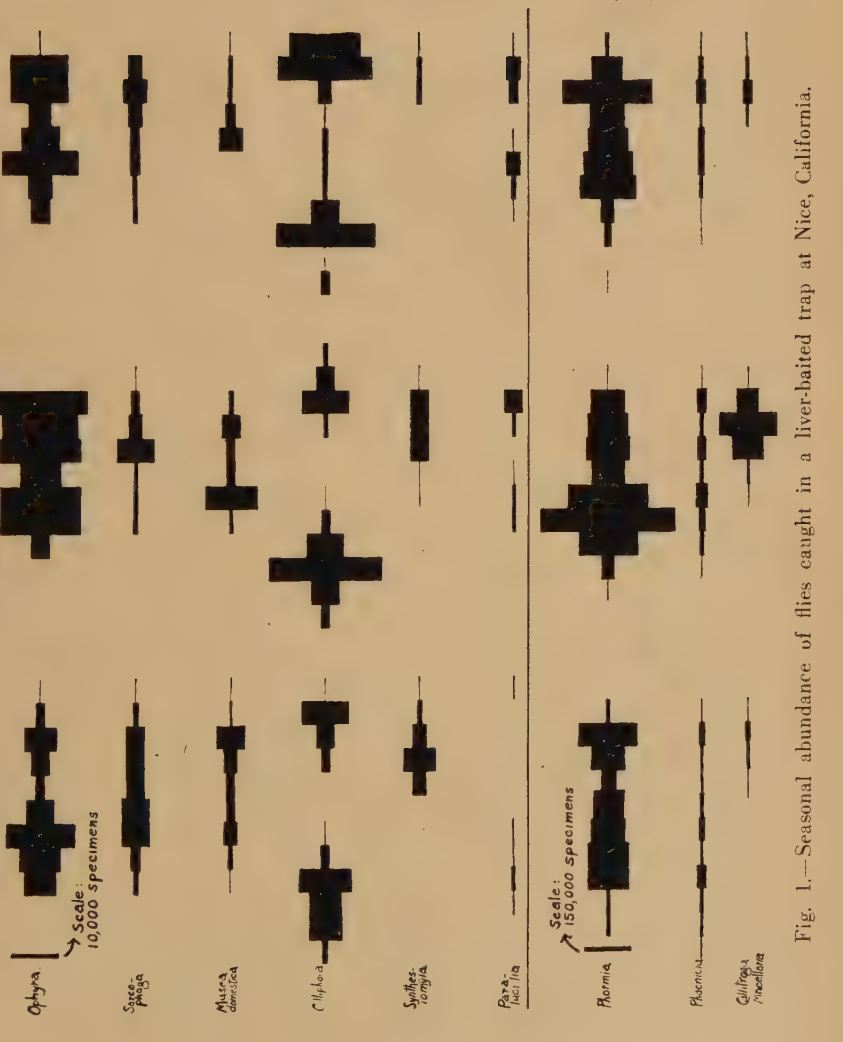

Fig. 1.—Seasonal abundance of flies caught in a liver-baited trap at Nice, California.

It appears likely that the winter of 1939-1940 was sufficiently mild so that *C. macellaria* at least survived as far north as Visalia, California. The mean temperatures for December, January, and February at this location were 5.7°, 4.8°, and 3.1°, respectively, above normal. The average mean was 52.3°, which may have permitted both species to survive. It appears likely that the early (June) appearance of *C. macellaria* in the trap at Nice is accounted for by the overwintering of the species farther north than is usual in California. The species was first observed in the trap collections of July 17-30, 1939, June 14-30, 1940, and August 1-15, 1941. No specimens were ever found after December 15. During August, September, and October 1940 an enormous population had built up. In september 46 per cent of the entire catch was of this species.

Stewart and Roessler (1942), reporting on work at Davis, California, found that this species appeared in liver-baited traps in late July 1936. It was the predominating fly during August, September, and October. Bruce and Knipling (1936) at Ames, Iowa, caught *C. macellaria* in liver-baited traps in June 1933 and 1934. The species had apparently migrated from overwintering areas in Texas.

C. hominivorax was observed in the catch of flies taken during September 17-27, 1940. It is possible that the species was present in earlier trap collections, but because it is a relatively scarce insect and bears a close resemblance to *C. macellaria* it may have been overlooked. In the October 1-15 catch four specimens of *C. macellaria* were found in 3½ quarts of the 32-quart catch, and one fly was found in the 10-gram sample examined from the October 15-30 catch of flies. No flies were found during November. A number of screw-worm cases were reported in the county during September and October. Larvae collected from the wounds of these domestic animals were identified as *C. hominivorax*.

Ophyra spp. These flies were captured every trapping period over 7 to 8 months of each year. They constituted approximately 2 to 5 per cent of the total flies caught each month. As shown in Figure 1, this species was fourth in abundance. It is the last in a succession of flies to oviposit in carrion. The larvae perform the final clean-up of a carcass and appear to thrive on fat, ligamentous tissue, and slime that remain after other fly larvae have left.

Sarcophaga spp. These flies were present in the trap catches

during the greater part of the year. The number taken in a month ranged from less than 1000 up to 8000.

Musca domestica L. This species was captured each month from April through November. The number caught ranged up to 11,000 in a month and constituted up to 8.7 per cent of the total flies taken. Because this fly walks over foods in homes and restaurants after visiting all sorts of decomposing matter, including carrion, it is one of the most dangerous enemies of man.

Calliphora spp. These species are important because they frequently visit homes and contaminate meat by laying eggs on it. These flies predominated during the winter and accounted for 11 to 74 per cent of all flies taken during this period. Figure 1 shows that they are prevalent during the spring and fall but disappear almost entirely in the summer.

Synthesiomyia nudiseta. Late summer and fall was the optimum period of activity of this insect. It occasionally visits houses but is of little economic importance.

Paralucilia wheeleri (Hough). This fly closely resembles *C. macellaria* and *C. hominivorax.* It appears to vary in numbers from year to year more than do some of the other species. Specimens were frequently observed in the catch but not in the 10-gram sample, which was too small to quantitatively measure low numbers. For some unknown reason the incidence of the species was low during 1939 and higher during 1941. Deonier and Knipling (1940) reported on the distribution and life history of this species in Arizona.

Miscellaneous flies—A considerable number of small Diptera were taken in nearly every trap. They accounted for 2 to 15 per cent of the various catches of flies. No attempt was made to segregate the different species.

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A CASE OF REVERSE PREDATION IN THE CARABIDAE

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On July 31, 1952 Dr. J. W. MacSwain collected three living larvae of *Calosoma semilaeve* LeConte for the author in a Ladino clover field at Artois, Glenn County, California. Each of the specimens was placed in a small pill-box with a living prepupal noctuid larva as food, until arrival in Berkeley the following day.

Upon examination in the laboratory it was found that two of the three carabids had been entirely consumed by their supposed prey. Immediate dissection of the cutworms showed their intestinal tract to be clean, indicating a very rapid digestion. Examination of fecal pellets from the pill-boxes, however, revealed many small pieces of chitin and identifiable portions, such as legs, head capsule, tergites and urogomphi.

Whether the *Calosoma* larvae were attacked and killed, or whether they first died and were then consumed can only be conjectured. It is well known, however, that cutworms are often highly cannibalistic, as are most Carabid larvae, particularly when confined to a limited amount of space.

The literature is replete with examples of certain of the Carabidae feeding on cutworms and other lepidopterous larvae, but this is the first case to the author's knowledge where the reverse is apparently true.

TWO NEW SPECIES OF PSELLIOPUS AND SOME DISTRIBUTIONAL NOTES

(Hemiptera, Reduviidae)

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This paper is one of several now in preparation that are based upon material in the Museum of Zoology of the University of Michigan, where the types of the new species are deposited. I wish here to express my deep appreciation to Dr. J. Speed Rogers, Director, and to Dr. T. H. Hubbell, Curator of Insects, for the privilege of working over the extensive collections of Hemiptera under their care. Among the thirteen species of *Pselliopus* in the collection, four appear to be undescribed. Two of these, from Arizona and from New Mexico, are represented by females only; the other two are described herewith. As in other recent papers, I have expressed all comparative measurements here in hundredths of a millimeter.

Pselliopus karlenae Hussey, new species

Length: 12.2-13.1 mm., width of pronotum 2.9-3.2 mm.

Head black above, with a yellow mark above and in front of each eye and another at the side behind the eye, also a small yellow spot between the ocelli and a triangular one between the bases of the antennae; genae and gula yellow. First two antennal segments black, the others testaceous, first segment with three pale annuli of which the third is at the apex, second segment with a single pale ring at the middle; third segment with an obsolete sub-basal fuscous ring. Rostrum yellow, the first segment with a large piceous spot on each side at the middle, the second with a piceous annulus at the base, the third with a narrow piceous line on the lower side. Anterior lobe of the pronotum black, the collar (including the anterior angles), an irregular vitta on each side of the middle line, and a rather large spot on each side yellow; posterior lobe yellow, finely and closely concolorously punctate, the lateral angles with a triangular black spot enclosing the black spines, this spot narrowed behind and sometimes joining the blackish spot at the middle of the explanate postero-lateral margins. Scutellum black on the basal half, with a tomentose white dot each side near the base, the broadly foliaceous apex yellow. Body above with fine, fairly thick, erect golden pubescence. Hemelytra translucent or transparent, brown, the cubital veins prominent, fuscous; corium and veins of the clavus rather thickly provided with short, curved golden hairs. Dorsum of the abdomen black; connexival segments above and below sanguineous, broadly banded with black on the anterior portion, the extreme anterior margin sometimes narrowly yellow. Under side yellow, the pleura largely black, each ventral segment with a narrow black band on the posterior margin and also on the front margin toward the sides. Pleura, coxae, and basal segments of the venter at the

sides with spots of white tomentum, the mesosternum densely white tomentose, the metasternum less so except at the sides. Femora and tibiae yellow, the femora with five black annuli (some of them more or less interrupted), the tibiae with three black annuli on the basal half and with an abbreviated brownish stripe on the apical half of the dorsal face. Male genital segment with two black stripes below on the posterior half, these uniting at the base of the median spine; parameres and median spine of hypopygium black.

Head shorter than the pronotum (218:272), four-fifths longer than its own width across the eyes (218:120), gradually narrowed behind the eyes. Ratios of lengths of antennal segments I-IV, 441:185:277:155. Pronotum smooth or nearly so, the punctures of the posterior lobe extremely shallow; median impression of the anterior lobe fairly deep, continued as a broad shallow depression onto the posterior lobe but not attaining the base of the latter. Humeral spines short, conical, directed outward, equalling or slightly surpassing the lateral angles. Postero-lateral margins rather narrowly explanate, strongly reflexed behind and lightly sinuate, produced as very short and rather wide lobular processes at the posterior angles. Hind margin of the pronotum most lightly convex before the scutellum. Disk of the scutellum with a Y-shaped ridge whose median (apical) arm is abbreviated behind, evanescent at about the middle of the scutellum; apical portion moderately broad, horizontal, its postero-lateral margins narrowly reflexed, vertical; apical portion less pilose than the basal part; total length of the scutellum one-third greater than that of the anterior lobe of the pronotum (147:110).

Margin of the male hypopygium with a long, rather robust median spine which is bifurcate for only a short distance at the tip, the apices distinctly divergent (Fig. 1). Parameres as seen from behind fusiform, rather strongly curved on the inner side, setulose near the pointed tips and scantily so on the inner side; when seen from the side the tips of the parameres are rather abruptly curved upward. Last tergite of the male abdomen strongly arched transversely to accommodate the hypopygial spine.

Holotype male and *allotype* female: HONDURAS, DEPT. MORAZAN, MT. CACULATEPE, ELEVATION 3700–4200 FEET, Aug. 6, 1948 (T. H. Hubbell). *Paratypes* (all collected by Dr. Hubbell): 1 ♂, 3 ♀, same data as the preceding; 1 ♀, Cerro Uyucaguatal, 4500–5000 ft., July 12, 1948; 1 ♀, five kilometers southwest of Suyapa, 5300 ft., Aug. 5, 1948; also two paratypes, ♂ and ♀, from Mt. Caculatepe in my collection. These localities are all in the vicinity of the Escuela Agricola Panamericana at Zamorano, about 35 kilometers southeast of Tegucigalpa. The specimens from Mt. Caculatepe were taken by sweeping and by beating shrubbery, and numerous examples of *P. zebra* (Stål) were collected with them.

This species is closely allied to *P. zebra* but is readily separable by the first antennal segment which bears three pale annuli instead of four, by the sanguineous areas on the connexival segments, by the male genitalia, and by the strongly arched last tergite of the

male abdomen. The specimens of *zebra* before me agree with Stål's description in having the first antennal segment quadriannulate, and Champion, in the Biologia (Vol. 2, p. 247) implied that this is the usual condition, yet all three of his figures of *zebra* and

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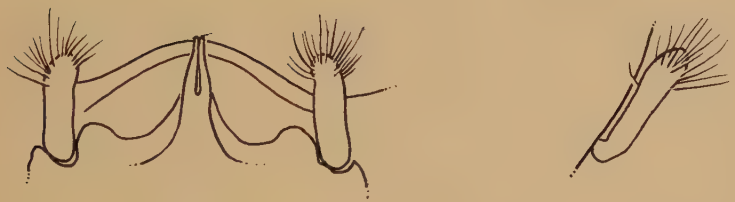

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EXPLANATION OF FIGURES

Fig. 1 *Pselliopus karlenae* Hussey, Fig. 2 *Pselliopus zebra* (Stål), Fig. 3 *Pselliopus latispina* Hussey. At left, apex of male hypopygium, with median spine and parameres, and outline of last tergite of male abdomen, as seen from behind. At right, left paramere as seen from the side.

varieties *(op. cit.*, Pl. 15) show this segment as triannulate. In *P. zebra* (Fig. 2) the median spine of the hypogydial margin is cleft or sulcate on the apical third and the tips lie parallel and contiguous; the parameres are lightly clavate, blunt at the tips, and thickly pilose on all sides for some distance before the apex.

P. karlenae may well have been confused with *P. zebra* in the past, particularly if only females were at hand, but I cannot identify it with any of the "varieties" described by Champion. The coloration of the anterior pronotal lobe (but not the posterior one) is quite similar to that shown by Champion in Fig. 5 of Plate 15, but in the present species the black color extends onto the sides to enclose a large yellow lateral spot.

Pselliopus latispina Hussey, new species

Length, ♂ 10.9 mm., ♀ 12.8–13.1 mm.; width of pronotum, ♂ 3.1 mm., ♀ 3.7–3.9 mm.

Yellowish ochraceous (as in *P. barberi* Davis), the legs more yellowish, marked above with black as follows: the tylus entirely, two lines forming a V leading from the middle line between the eyes straight to the antennae, the dorsal portion of the head from the base of the swollen part to the middle of the eyes (except a round yellow spot between the ocelli), joined behind the ocelli with a broad vertical band on the side of the head, where a narrow black line extends forward from the lower edge of this band to the postero-ventral angle of the eye, an anterolateral spot on each side of the anterior pronotal lobe, a narrow transverse uneven line (sometimes obsolete) in the interlobular sulcus, the blunt humeral spines and a very narrow area around their bases, an oblique elongated marginal spot at the middle of the strongly reflexed postero-lateral margins of the pronotum, the basal part of the scutellum (which bears a subbasal spot of white tomentum at each side), and a black band (both above and below) at the basal third of each connexival segment, these bands abbreviated inwardly and widened outwardly to reach the anterior angles of their respective segments. Antennae colored as in *P. karlenae;* first two rostral segments marked as in that species, the third almost wholly black. Legs yellow, the femora with five narrow black bands of which the apical one is somewhat the widest; front and middle tibiae with four black bands; hind tibiae with three such bands on the basal half and with a blackish stripe on the anterior and the posterior faces of the apical half; tarsi dark brown. Ochraceous color of the abdominal tergites plainly visible through the translucent hemelytra, the clavus somewhat more embrowned than the corium or the membrane. Dorsum with rather short and sparse erect pilosity, the curved hairs on the hemelytra more sparse than in *P. karlenae.* Venter ochraceous, each segment narrowly banded with black on the anterior margin, and with a second, abbreviated, black band on about the outer fourth of its width, none of these bands reaching the inner margin of the connexivum; the abbreviated markings on the connexivum below dislocated with respect to the fasciae of the ventral segments.

Male genital segment with a pair of blackish spots on the ventral side before the apex.

Head one-fourth shorter than the median length of the pronotum (♂ 188:250), three-fifths longer than its own width across the eyes (188:117), the interocular width more than twice the width of an eye (61:28). First antennal segment two and one-third times as long as the second, more than one-half longer than the third (350:150:220), and nearly twice as long as the head (350:188). First rostral segment attaining the middle of the eyes, slightly shorter than the second (93:100) when both are measured on the upper edge.

Pronotum smooth or nearly so, the posterior lobe flattened but not or hardly depressed along the middle line, very finely but not thickly punctate, the punctures scarcely impressed, less thickly pilose than the anterior lobe. Anterior angles nodose-tuberculate; humeral spines blunt, directed slightly backward, not or scarcely surpassing the lateral angles; postero-lateral margins rather widely explanate, strongly reflexed and lightly sinuate, produced at the posterior angles into finely punctulate lobules as long as the transverse width of an eye, inner margin of the lobules forming a right angle with the transverse posterior margin of the pronotum.

Scutellum with a Y-shaped ridge on the basal part, the median (apical) arm of this Y evanescent at the middle of the scutellum but forming a conspicuous pale calloused spot; produced apical portion rather broad, finely punctate, obliquely reflexed as seen from the side, with a deep cup-like impression before the apex, the postero-lateral margins moderately reflexed.

Margin of the male hypopygium with a long, broadly triangular median spine which appears not to be sulcate or furcate; parameres very slender (Fig. 3). In the only male before me the spine is directed obliquely forward and upward under the last tergite of the abdomen.

Holotype male, MEXICO, STATE OF HIDALGO, 6.5. KM. NORTH OF DURANGO ON CAMINO NACIONAL NO. 1, ELEVATION 6500 FEET, August 29, 1948 (T. H. Hubbell). *Allotype*, ♀ and one paratype ♀: MEXICO, State of Nuevo León, 15 miles north of Linares, Dec. 16, 1941 (I. J. Cantrall and J. J. Friauf), the paratype in my collection.

Easily distinguished from the other species of *Pselliopus* before me by the much larger and more strongly produced posterior lobe-like processes of the postero-lateral margins of the pronotum. Other distinguishing characters are the almost complete absence of a median impression on the posterior lobe of the pronotum, and the interrupted and dislocated transverse black fasciae of the venter and connexivum below. In size and color, and also in the male genital characters, it is perhaps nearest to *P. barberi* Davis, but apart from the differences already indicated, this latter species has the parameres somewhat longer and more strongly twice-curved, the scutellum is not obliquely reflexed on the apical part and lacks the cup-

like pre-apical impression, the transverse base of the pronotum is relatively wider, and the venter is without black bands.

PSELLIOPUS LATIFASCIATUS Barber

Three specimens in the Michigan collection from Alachua County, Florida, constitute the first records of the species from that state.

PSELLIOPUS CINCTUS (Fabricius)

In his "Heteroptera of Eastern North America" Blatchley (1926, p. 574) referred to this species as more southerly in its distribution than *P. barberi*, and stated that it had been taken only in the southern third of Indiana. The Museum of the University of Michigan has specimens from Lake County, Indiana, and from Cook County, Illinois, both of which border on Lake Michigan and lie in the northernmost part of their respective states. There is also one individual from southwestern Michigan, collected by G. Orton Sept. 7, 1949, in Allegan County (which also borders on Lake Michigan), approximately seven miles east of Saugatuck. This species has not been known before from Michigan.

ATRACHELUS CINEREUS (Fabricius)

In 1921 (Psyche, 28: 10) I reported the capture of two examples of this species by the late A. W. Andrews in Wayne County, Michigan, during the summer of 1918. These still are the only specimens I have seen from Michigan or from adjacent areas.

RHINIGIA CINCTIVENTRIS (Stål)

The Michigan collection has one example from Clarke County, Alabama, taken by A. F. Archer in May, 1935, at Salt Mountain, six miles south of Jackson and approximately 50 miles north of Mobile. I believe this is the first record for this species east of the Mississippi River.

LEPTIDIELLA BREVIPENNIS (MULSANT) REARED FROM TOYON

(Coleoptera: Cerambycidae)

The minute introduced longhorn *Leptidiella brevipennis* (Mulsant) has been recorded from California by Linhley (1934, Pan-Pacific Ent., 9 (4):170), and Middlekauff and Underhill (1949. Pan-Pacific Ent., 25(3):128). Mr. L. W. Swan obtained a new host and distributional record by rearing in 1950 a specimen (det. E. G. Linsley) from a native shrub, toyon or Christmas berry, *Photinia arbutifolia*, at Stanford University, Santa Clara Co., California.—HUGH B. LEECH, California Academy of Sciences, San Francisco.

THE ABSENCE OF NEGATIVE PHOTOTROPISM IN THE MEXICAN CHICKEN BUG, HAEMATOSIPHON INODORUS (DUGES)

(Hemiptera: Cimicidae)

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The nocturnal feeding habits of the common bedbug, *Cimex lectularius* Linn., and other species of the family Cimicidae are well known. In experiments with this species, the bugs were generally fed in darkness (Johnson, 1942) or in partial darkness. *C. lectularius* will move toward the dark when subjected to a bright light (Kassianoff, 1937). In contrast to this R. E. Ryckman (personal communication) has observed the feeding of *Haematosiphon inodorus* (Duges) on nestling barn owls in the presence of abundant light under field conditions. The owl nests were in cave-like holes ten to twelve feet down from the top of a 35 foot bank on the south side of the Santa Ana River near Norco, California. *H. inodorus* will feed on chickens in the laboratory in bright light. Because of these and other observations of the actions of this bug, it was decided to attempt to determine whether it does or does not exhibit a photonegative tropism.

One hundred *H. inodorus* adults were taken at random from the main colony and placed in a jar with a screw-type lid; the jar was 7 inches long and 1¾ inches in diameter. One half of the length of the jar was painted black on the outside; the other end of the jar was left unpainted. The jar was placed on a light background under an inverted aquarium. Two 200-watt lights were placed approximately 12 inches from the middle of the jar just outside the aquarium. The aquarium served to reduce the radiation of heat between the light source and the jar containing the bugs, thereby tending to decrease any tropism to heat which the insects might show. A nearly light-proof room was used in which to conduct the experiment.

The bugs were concentrated in the painted area by tapping that end of the jar while it was held lower than the unpainted area. The jar was then quickly placed under the aquarium. For five minutes the lights were switched on simultaneously. Twelve bugs had moved into the unpainted area during the dark period. After five minutes of light, another dozen bugs joined this group. Occasionally one or two bugs would run into the darkened portion of the jar but would either run out again or be replaced by one or

two other bugs. After the lights had been on for ten minutes, the number in the unpainted area was approximately the same. No fear of the light seemed to be indicated. Copulation by several pairs took place. There was an unsuccessful attempt by some to climb the walls of the jar.

The experiment was repeated with the procedure reversed; the bugs were concentrated in the light end of the jar before the five minute period of darkness. When the lights went on, apparently only a very few had shifted to the painted end of the jar during the dark period. After five minutes of light, the bugs seemed to be grouped toward the end of the unpainted area away from the dark. A number again were seen copulating in the light. At the end of ten minutes of light, only a very few had moved into the painted, dark portion of the jar.

A similar experiment was set up involving one hundred *Cimex lectularius* adults. The bugs were concentrated in the dark end of the jar, and the experiment was conducted as before. At the end of the five minute dark period, five insects were seen in the clear area. At the end of the first five minute light period, there were still only five *Cimex* in the unpainted end of the jar. After ten minutes of light, this number had dropped to two. During the time the light was on, a few individuals were seen to come from the dark zone, go into the unpainted area, and then go back to the dark zone.

The *Cimex* were then concentrated in the unpainted area and quickly put under the aquarium. The lights were turned off for five minutes as before. When the lights were turned on after five minutes of darkness, the large majority of *Cimex* were still in the clear area. After five minutes of light, only nine bugs were still in the unpainted zone.

From these experiments, from the observations of Ryckman in the field, and from observations of the general lack of negative reaction of the insect to the light in the laboratory, *H. inodorus* appears to exhibit an absence of the negative phototropism seen in *Cimex lectularius*. In fact, *H. inodorus* may be said to show a slight positive phototropism.

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